Acta Orthop Scand *56*, 277–282, 1985

Proceedings Norwegian Orthopaedic Society

Oslo, 22–27 October, 1984

Editor:
Bernhard Paus

Ullern alle 117, Oslo 3,
Norway

Orthopaedic microsurgery

Astor Reigstad & Karl Reinert Hetland

Kronprinsesse Märthas Institutt, Oslo, Norway

We reviewed the microsurgical work carried out during 1 year in an orthopaedic department specializing in hand surgery: 200 peripheral nerves were sutured, and 24 replantations were performed. The healing rate for finger replantations was 40 per cent whereas the healing rate for amputations proximal to the fingers and amputations of the lower extremity was 100 per cent. Six second toe transfers for thumb amputations were done. Two free fibula grafts and one free crista graft were performed.

The fate of a completely devascularized femoral head. A case report

Pål Benum

Department of Orthopaedic Surgery, Trondheim University Hospital, Trondheim, Norway

A 35-year-old man with a combined fracture of the femoral neck and head was followed up for 6 years after osteosynthesis. None of the femoral head fragments had soft tissue attachments. After healing of the femoral neck fracture, there was an increased femoral head isotope uptake at Tc-scintigraphy compared to the opposite hip. From 2 to 4 years postoperatively a significant collapse developed. Later, no further deformation of the femoral neck was seen. Although a slight collapse of the femoral head also developed, the impairment of the joint function was only moderate.

These observations show that revitalization of a completely devascularized femoral head can take place after healing of a femoral neck fracture without extensive collapse of the femoral head.

Dislocation of the distal radio-ulnar joint

Astor Reigstad & Svein Waage

Kronprinsesse Märthas Institutt, Oslo, Norway

Isolated dislocation of the distal radio-ulnar joint with the distal end of the ulna situated volarly should be reduced in plexus or general anaesthesia by supinating the hand. If closed reduction does not succeed, open reduction should be performed following a period of 4–6 weeks in plaster of Paris. Inveterate dislocations usually have to be treated by Darrach's procedure. A case of distal radio-ulnar dislocation was operated 3 months after the injury with open reduction and reconstruction of the intra-articular disc and the ligaments. The forearm rotation, which was strongly restricted preoperatively, had become normal 6 months after surgery.

Carpal-tunnel syndrome. Results from a retrospective study of operated hands

Terje Nord

Department of Surgery, Hedmark Sentralsjukehus, Elverum, Norway

The results are presented of a retrospective investigation of 75 patients with 98 operated hands. The mean observation time was 36 months. The nerve conduction latency (distal motor delay) was preoperatively registered in all but eight hands. In four of five hands with normal distal latencies, division of the transverse carpal ligament achieved good results. The condition was correctly diagnosed at the first visit to the doctor in less than 40 per cent of the cases. Five patients mainly complained of Raynaud-phenomena as manifestations of the syndrome, while seven patients developed flexor tenosynovitis

with "trigger finger" later during the observation time. None of these seven patients suffered from rheumatoid arthritis.

Two recurrences were registered, while peroperative lesion of the sensory palmar branch occurred in two hands. The patients reported the results of the decompression of the median nerve as excellent or good in 89 per cent of the cases. The diagnosis may be difficult. Normal distal motor conduction time does not exclude a diagnosis of carpal-tunnel syndrome. One should think of the possibility of the condition in patients presenting with Raynaud-phenomena from the upper extremity. If the patient complains of pain and dysfunction after a decompressive operation, flexor tenosynovitis should be considered as a possible explanation.

A comparative study of bioglass-coated titanium and titanium implants in cats

Elin Barth, Helge Rønningen & Ludvig Fjeld Solheim

Institute for Surgical Research, University of Oslo, Oslo, Norway

The bone-implant interfaces of 45S5F bioglass-coated titanium implants and pure titanium implants were studied. Cylindrical implants were placed in feline femurs, and 6 weeks later the strength of the implant-bone interfaces was tested using pull-out tests. Elemental investigations of the implant surfaces and their surrounding bones were performed with energy dispersive x-ray microanalysis.

The ultimate shearing force at the titanium-bone interface was significantly higher than at the bioglass-bone interface. The corresponding ultimate shear stresses showed no differences. This was due to the smaller active surface area of the bioglass-coated implants, as parts of this coating had vanished *in vivo*. The ultimate shear stress at the titanium-bone interface increased with the increasing calcium-phosphorous ratio, reflecting increasing maturity of the bone. The increase in ultimate shear stress at the bioglass-bone interface was proportional to the increase in silicium-phosphorous ratio in the surrounding bone and also proportional to the loss of silicium from the bioglass-coat. Only the bone around the bioglass-coated implants contained sulphur, indicating a process of enchondral ossification. The results are interpreted as a qualitative difference in the reparative process evoked in bone surrounding bioglass compared to bone surrounding titanium.

Bending instability in femoral osteotomies in the rat

Anders Mølster

Surgical Research Laboratory and Department of Dental Materials, Haukeland Hospital, University of Bergen, Bergen, Norway

Osteotomy and osteosynthesis were performed with interlocking intramedullary nails on the left femur of 96 male Wistar rats. The locking was achieved with a dental composite, cementing the ends of the nail to the bone. The animals were divided into two groups, one operated with a rigid nail made of stainless steel and the other with a flexible nail made of polyacetal. Radiographs were taken at 2–6-week intervals, and 12 animals from each group were killed at 4, 8, 10 and 24 weeks. Both femora were mechanically tested and measured for callus area. There was no significant difference in time to union between the two groups. No significant differences in mechanical properties were observed before 24 weeks. At this time, strength, deflection, toughness and resilience were significantly greater in femora with flexible polyacetal nails, while no difference in stiffness was found between the two groups. The lower values for mechanical properties in the femora with steel nails are interpreted as an effect of stress shielding. In conclusion, high flexibility of nails prevented late stress protection effects without delaying union.

Operation for pressure sores in the pelvic region

Pål Benum

Department of Orthopaedic Surgery, Trondheim University Hospital, Trondheim, Norway

Twenty-two pressure sores (tuber region 12, sacral 7, trochanteric 3) in ten paraplegics and seven other patients with neurological disorders were treated with radical excisions, eventually combined with bone resection (17 sores) and rotational flaps (5 sores). Two sores did not heal primarily; recurrence was seen in two patients. Three of these sores were localized to the tuber region, and one to the trochanteric. Final healing occurred after more extensive bone resection in two of the tuber sores; the trochanteric sore healed after rotational flap transposition. After an average of 22 months, excellent skin cover was found in 19 sores.

Extensive bone resection and rotational flap procedure are important. However, simple skin excision and bone resection give satisfactory results in most cases of sores in the tuber region.

The interlocking nail. A fixation alternative in osteotomies

Knut Strømsøe, Bjørn Olav Thoresen & Antti Alho

Orthopedic Division, Ullevaal Hospital, Oslo, Norway

Locking the intramedullary nail at one or both ends to induce rotational and longitudinal stability makes the method suitable for osteotomies. Since 1979, we have performed 13 osteotomies on 12 patients (seven male and five female, median age 22 (range 16–60) years).

Eight osteotomies were performed for anisomelia; seven of them were post-traumatic and one was caused by CDH. Seven osteotomies were shortenings and one was a lengthening. One tibial osteotomy was performed to correct rotatory malalignment after fracture. Four further osteotomies were performed for anteversion of the femoral neck with clinical symptoms, one patient was operated bilaterally, and two patients unilaterally. These patients could not bear weight as early as was expected. All osteotomies were done open, and all except for one were performed dynamically, with locking at one end of the nail only.

The follow-up varied from 18 to 6 months. There were no infections. The nail fractured proximally in two cases with no consequences for healing. Radiological healing was registered after 18 (range 6–52) weeks, except for one case with non-union where an axial compression osteosynthesis with free autogeneic bone grafting was warranted.

Full weight-bearing was obtained after 8 (range 2–16) weeks, except for the non-union case. The metal was removed at the end of the observation period in all but one case. We conclude that interlocking intramedullary nailing represents an alternative in osteotomies in the diaphyseal area of the femur and tibia.

Strength of different ostheosynthesis methods in fractures of the femoral neck. Mechanical and computer tomographic study *ex vivo*

Torstein Husby, Antti Alho, Arne Høiseth & Henrik Moen

Ullevaal Hospital, University of Oslo, Oslo, Norway

Forty-eight normal cadaveric femora (60–85 years) were used. Computer tomography (CT) was carried out on the head, neck, trochanter, diaphysis and condylar area. A vertical neck osteotomy was made on one femur of each pair. The osteotomies were fixed using the following implants: Thornton nail, two von Bahr screws, three Knowles pins, three Gouffon pins, Haukebø compression screw and AO compression screw. The other intact femur was used as control. The femora were then tested biomechanically with registration of load and displacement (Instron). The load ratio, test/control at 5 mm displacement, was used as an expression of the relative strength of the osteosynthesis. The von Bahr screws gave significantly stronger fixation than the Gouffon pins ($P < 0.05$; randomization test for two independent samples), which again were stronger than the Knowles pins ($P < 0.05$). Due to wide ranges, there were no significant differences between the von Bahr screws, Haukebø screws and AO compression screws. The Thornton nail showed an unsystematical spreading of the results.

The CT density of the femoral condyles (mean of values between 100 and 1000 Houndsfield units) showed a significant correlation between the right and left side ($r = 0.90$, $P < 0.001$), whereas scattered results were achieved in the other areas. Comparing the CT and mechanical results, we found a significant correlation between the density and maximal strength of the control femora ($r = 0.82$, $P < 0.001$). This indicates that CT can be used for the relative measurement of osteotomy, facilitating *ex vivo* and probably *in vivo* studies.

External fixation of open tibial fracture

Arild Nesbakken, Antti Alho, Arthur Johan Bjersand[1], Dag Kjartan Jensen[1], Lodve Stangeland & Anders Walløe

Surgical and Roentgenological[1] Departments, Haukeland Hospital, University of Bergen, Bergen, Norway

Thirty-three compound fractures of the tibial shaft were treated with external fixation in 1974–81. The fractures were divided into Grades 1–3 according to the wound.

Severe, soft tissue lesions required early amputation in one patient. In the remaining patients, 14 of whom had Grade 3 soft tissue lesions, wound healing was obtained within 18 (median 5) weeks.

One patient developed non-union. In the rest of the patients, the median time until full weight-bearing without pain was 32 (range 8–60) weeks; 24 weeks in 15 Grade 1 and 2 fractures, 26 weeks in seven Grade

3 fractures involving one segment of the tibia, and 42 weeks in seven Grade 3 segmental fractures. Seven patients were considered to have delayed union.

Two patients developed chronic osteomyelitis requiring revisions and long-term antibiotic therapy before they were cured after 2 and 2.5 years, respectively.

Twenty-three patients attended a follow-up examination 1–9 years after the injury. The final result was considered excellent in five, good in nine, acceptable in five, and poor in four patients. All the patients with a poor final result had developed a compartment syndrome after the injury, and their main sequela was severely reduced motion in the ankle and subtalar joints.

We conclude that external fixation is the primary treatment of choice in tibial fractures associated with Grade 2 and 3 lesions of the soft tissues. Ischemic damage to the soft tissues, is the main cause of sequelae in these injuries, and immediate complete fasciotomy is warranted in a considerable number of cases to avoid further ischemic damage due to compartment syndrome. Other forms of fracture treatment should be considered 2–3 months after the initial external fixation to accelerate the union of the fracture.

The effect of Naproxen after internal fixation of leg fractures

Knut Strømsøe & Håvard Bjerkholt

Ringerike Sykehus, Hønefoss, Norway

A randomized, double-blind, placebo-controlled parallel study was performed to examine the effect of naproxen on the immediate course after internal fixation of leg fractures. Naproxen 500 mg was administrated immediately preoperatively and then every twelth hour post-operatively as suppositories for 3 days. The circumference of the leg was measured at the same hour every day at three different defined sites on the leg. The subjective range of pain at the knee and the ankle according to the "0 – Durchgangsmethode" and the need for strong analgetics were measured on the first and the fourth post-operative day.

A total of 41 patients entered the trial: 21 were on naproxen and 20 on placebo. Allocation of patients to the two treatments was random. Fourteen of the patients entering the trial were operated immediately, while the rest were operated within a week after admittance. The patients in the naproxen group showed significantly less edema than the patients in the placebo group. Functional registration showed significantly better results in the knee and ankle in the naproxen group than in the placebo group. The subjective range of pain showed no significant difference between the two groups, but the patients in the naproxen group had less demand for strong analgetics in the post-operative course.

The study showed a clear positive effect of naproxen on the immediate post-operative course after internal fixation of leg fractures. The groups were assessed for baseline comparability using the *t*-test for continuous variables and the chi-square-test for dichomotous variables.

The direct transgluteal lateral approach to the hip

Tore Blom Hagen & Astor Reigstad

Kronprinsesse Märthas Institutt, Oslo, Norway

The direct transgluteal lateral approach to the hip, first described by McFarland & Osborne (1954) and modified for prosthetic replacement operations by Hardinge (1982), was adopted in our clinic in 1983 and is now the standard approach in all types of prosthetic surgery of the hip. The approach combines the advantages of the transtrochanteric and anterolateral approach and allows adequate access for orientation of the acetabular and femoral implant. Good gluteal function is seen postoperatively.

Early complications in patients with trochanteric fractures treated with Richard's hip compression screw

Lars Viksmoen, Erik Omland & Ola Petter Niels Grüner

Surgical Department, Baerum Hospital, Oslo, Norway

During 1981–83 118 patients with trochanteric fractures were treated with Richard's HCS. The percentage of surgical complications was: deep infections – five, poor fixation of screw in the femoral head – three, damage to the acetabulum by perforated screw – one, pseudoarthrosis – one, and protrusion of screw one.

In 8 per cent of cases, reoperations were necessary: Removal of HCS – five, Girdlestone – five, and total hip replacement – one.

The results proved better in cases with an intact lesser trochanter (type AI according to the AO-clas-

sification) than with medial-posterior comminution ($p < 0.05$).

Postoperative varus- or valgus position in the AP view, anteflexion in the axial view and shortening of the leg by more than 2 cm were all associated with an increased number of technical complications ($p < 0.01$). Varus position and shortening of the leg by more than 2 cm were also associated with an increased number of reoperations ($p < 0.05$).

The combination of a cranial position of the screw in the AP view and a dorsal position in the axial view showed an increased number of both technical complications and reoperations ($p < 0.01$).

Richard's HCS is associated with few early complications and reoperations. Accurate reduction and correct positioning of the implant are essential for optimal results. Keeping the fracture classification in mind is important. An initial period of non-weight-bearing is recommended in unstable fractures (A2 and A3 according to AO-classification). Deep infections in 5 per cent of cases have encouraged peroperative antibiotic coverage.

Interlocking intramedullary nailing of femoral and tibial fractures

Bjørn Olav Thoresen, Arne Haukebø, Arne Eskeland, Knut Strømsøe, Gunnar Follerås & Antti Alho

Ullevaal Hospital, University of Oslo, Oslo, Norway

Interlocking intramedullary nailing (Grosse-Kempf) was studied on 88 adult patients with 48 femoral (4 compound) and 45 (7 compound) fractures followed up for 12–49 months. Twenty patients had sustained major multiple injuries. Eighty-four nailings were closed and nine were open. Interlocking screws were inserted in both ends of the nail in 19 cases (static nailing), in the proximal end in 21 cases, and distally in 53 cases (dynamic nailings). Additional bracing was necessary in two cases. Full weight-bearing was possible within 1 month in 46 cases, within 3 months in 35 cases and within 6 months in 11 cases.

The infections, one superficial and one deep, both healed. The reoperations were: five corrections for malposition without change of the nail, one change of screw due to material fatigue and one debridement for infection. Due to shortening (2.5–4 cm), malalignment (varus of valgus 5–10°, rotation 15–20°) and extension deficit of the knee (15°), 12 results were classified as fair, and one non-union and two major malalignments were designated as poor. Seventy-eight results were classified as excellent or good.

We conclude that interlocking intramedullary nailing is expedient in adults in high and low diaphyseal fractures and in segmental and comminuted fractures with rotational instability and shortening tendency. In compound tibial fractures (Grade III), other methods should be used. The static nailing technique did not impair fracture healing, but gave effective rotational and longitudinal stability.

Intertrochanteric osteotomy or total hip replacement for coxarthrosis

Roger Sørensen, Astor Reigstad & Merete Brandt

Kronprinsesse Märthas Institutt, Oslo, Norway

We compared 35 intertrochanteric osteotomies with 358 total hip replacements in patients operated for osteoarthritis of the hip in the period 1978–1983. The patients with osteotomy were on average younger and had less complaints preoperatively than the patients with total hip replacement. Postoperatively, the latter group of patients had significantly higher scores for pain hip motion, walking ability and total hip function according to the Charnley grading system. Compared to the preoperative scores, the clinical gain after a prosthetic replacement was much higher than after an intertrochanteric osteotomy. It is concluded that intertrochanteric osteotomy should only be performed in certain younger osteoarthritic patients.

Total hip arthroplasty after Schanz osteotomy

Arne Skoglund & Astor Reigstad

Kronprinsesse Märthas Institutt, Oslo, Norway

In 1922, Schanz introduced his osteotomy as treatment for congenital hip dislocation. He placed the upper femur at an angle against the pelvis, while the lower fragment was placed parallel with the normal weight-bearing line of the extremity. This gives these patients a better range of motion, less shortening, improved stability of the pelvis and an improvement of the lordosis caused by bowing the fragments forward as well as toward the midline.

Later in life, some of these patients will need a total hip arthroplasty. On these patients it is a difficult procedure, which many authors do not recommend. At our hospital, during the last year, we have carried out total hip arthroplasty in four hips in three patients with a former Schanz osteotomy. All three patients were women, and all three had severe pain in their hips preoperatively.

We used a direct lateral approach. The acetabulum was placed in its original place using the osteotomized caput as a shelf. A new osteotomy was done at the former osteotomy site to correct the axis, and the new osteotomy was immobilized with the stem of the prosthesis.

All three patients had lengthening of the operated legs, all have pain-free hips and all walk better than before the operation, although two of them still have a positive Trendelenburg sign.

Electrical surface stimulation in idiopathic scoliosis

Johan Emil Lange, Ingjald Bjerkreim & Kari-Mette Marthinsen

Sophies Minde Orthopaedic Hospital, Oslo, Norway

LESS-treatment was used in 17 patients selected following the international protocol for LESS (Scolitron project), including 15 girls and two boys with mean age 12.9 years, and skeletal age 12.5 years. Twelve curves were simple and five double. Fifteen were localized at T8–9 level, and two at L1–2. The mean scoliosis curves in the dorsal region were 29° (20°–40°). The electrode was localized in the thoracic region 14 times, in the lumbar region twice, and in both thoracic and lumbar regions once.

During 12 months of treatment, eight patients developed localized dermatitis, insomnia and psychoneurosis, two had curve progression, and one did not cooperate. Five patients still under treatment have allergic or toxic reactions to the pad and current.

Eight patients stopped the LESS program after 3–12 months. Of these, three are using the Boston-brace, one has been operated and four are under observation without treatment.

After 12 months of treatment, the scoliosis has improved in five patients (mean 4.5°), is unchanged in four and increased in eight (mean 4°). The results are better when the original curves were 29° or less; six of these patients (67 per cent) had improved or were unchanged. In eight patients with original scoliosis of more than 29°, only three (37 per cent) had improved or were unchanged.

These preliminary results after 12 months of treatment are disappointing. Allergy, dermatological and psychological complications are relative contra-indications; eight of the 17 patients had to stop treatment for these reasons (47 per cent).