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Experimental Orthopaedics

Osteopenia after castration in rats

Leyla Gurkan, Arne Ekeland, Kaare M. Gautvik*, Norvald Langeland, Helge Rønningen & Ludvig F. Solheim

Institute for Surgical Research, Rikshospitalet, and Institute for Medical Biochemistry*, University of Oslo, N-0027 Oslo 1.

Bone changes 6 to 12 weeks after castration have been studied in 25 female and 27 male middle aged rats. Castrated female rats gained more weight than their controls, but had decreased bone density and calcium and hydroxyproline content per cm³ bone volume of tibia. Castrated male rats did not differ from controls regarding body weight and the bone parameters. No influence of castration on the mechanical strength of the femora could be detected in either sex.

At two weeks after castration, the circulating levels of immunoreactive calcitonin (iCT) were decreased in female rats compared to controls. In contrast, iCT was increased both in castrated male and female rats 10 weeks later.

We conclude that castration of 6 months old female rats causes osteoporosis, and therefore represents a promising experimental model for studying post-menopausal bone loss.

The effects of joint immobilization on experimental bone healing

Terje Terjesen & Svein Svenningsen

Department of Orthopaedic Surgery, Trondheim University Hospital, N-7000 Trondheim

Unilateral midshaft tibial osteotomies in rabbits were fixed by 6-hole steel plates. In half the animals no additional fixation was used, while in the other half a plaster bandage from the toes to the mid-thigh was applied. The animals were sacrificed after 6 weeks. Radiographic healing with little or no periosteal callus had taken place in all the osteotomies. There was no significant difference in the amount of periosteal callus between the two groups. The strength and stiffness were significantly decreased in tibiae where plaster immobilization had been used. The median strength of bones without plaster was 107% of normal value, compared to 55% in the plaster group. Thus, the study indicates that the adverse effect on plate-fixed tibial osteotomies due to immobilization of the ankle and knee joint is of considerable extent.

Experimental fracture healing using plates with different degrees of stiffness

Terje Terjesen & Kristen Apalset

Department of Orthopaedic Surgery, Trondheim University Hospital, N-7000 Trondheim

Unilateral midshaft tibial osteotomies in rabbits were fixed by plates with four different degrees of stiffness. The least stiff plate was made of glass-fibre-reinforced epoxy, and the other three of stainless steel. The in vitro bending stiffness of tibial osteotomies fixed with the various plates were 13%, 17%, 61%, and 74%, respectively, related to the stiffness of intact tibiae. The animals were sacrificed after 6 weeks, and the healing bones evaluated by radiography, measurements of periosteal callus and biomechanical testing in 4-point bending. The amount of periosteal callus was inversely related to the stiffness of plate fixation. Decreased strength and stiffness were found in tibiae where the most ri-

gid plate had been used, compared to the values of those with the less rigid plates. This indicates that the stress-protection due to very stiff plates was pronounced even at 6 weeks. Redislocation of the osteotomy occurred in one third of the animals where the plastic plate had been used, showing that this plate was not strong enough for secure fracture fixation. Thus, the plates of the two intermediate degrees of stiffness proved to be the most appropriate ones for diaphyseal bone healing.

Limb lengthening by low rate epiphyseal distraction. An experimental study in the caprine tibia

Terje Fjeld¹ & Harald Steen²

¹Norwegian College of Veterinary Medicine, Oslo Dep. 1, Oslo

²Sophies Minde Orthopaedic Hospital, University of Oslo, 0570 Oslo 5

Low rate epiphyseal distraction of the proximal tibia using a modified bilateral Hoffmann external fixation device, was accomplished in 14 goats (age 6–7 months). Daily distraction at a rate of 0.5 mm was continued for 5 weeks. Physiolytic occurred after 5 to 9 days. After distraction had been discontinued, the external device was left in situ for fixation for 4 weeks. The animals in group 1 (n=6), group 2 (n=3) and group 3 (n=5) were sacrificed at 4, 16 and 32 weeks respectively from the end of the distraction period. The proximal growth plate of the elongated tibia appeared radiolucent at the conclusion of the study, but was less distinct and reduced in height compared to the control side. The gained lengthening at the end of the distraction period was reduced with further growth in all animals. In group 3 the final lengthening was reduced to the half.

Both tibiae of all animals were tested mechanically in torsion. The mean ultimate torsional strength of the elongated tibiae was 29 per cent in group 1, 79 per cent in group 2 and 95 per cent in group 3 compared to the control side.

It is concluded that leg lengthening by epiphyseal distraction in the proximal tibia is a realistic alternative to other lengthening procedures in individuals approaching adolescence.

Porous fibre titanium and bioglass coated titanium implants. A comparative study in a weight-bearing model

Elin Barth, Helge Rønningen & Ludvig Fjeld Solheim

Institute for Surgical Research, Rikshospitalet, Oslo 1, Norway

Porous fibre titanium implants can be fixed to bone by bone ingrowth, and bioactive glass ceramics have been fixed to bone in non-weight bearing models. In this study the mechanical strength of fixation of 45S5F bioglass-coated compact titanium and porous titanium implants to bone were compared. A weight bearing model was designed where metaphyseal segments of rat tibias were replaced by implants. One third of 108 rats received bioglass-coated implants, one third porous titanium and one third osteotomies. The animals were killed in groups of 12 at 3, 12 and 26 weeks. After bending tests of the operated and the control tibias, the porous implants were assessed for amount and composition of the ingrown bone. The strength of the osteotomies and the distal porous titanium-bone interfaces approached that of the control tibias at 12 and 26 weeks postoperatively. The bioglass-coated implants were loose at all intervals. There was a linear proportionality between amount of ingrown bone and strength of fixation of the porous titanium implants and a curvilinear proportionality between strength of fixation and degree of mineralization of this bone.

Hip arthroplasty

The Christiansen Total Hip

Henrik Moen, Gunnar Follerås, Bjørn Olav Thoresen, Antti Alho

Orthopaedic Division, Ullevål Hospital, Oslo

The material consists of 171 hips, operated on in the Surgical Department 2, Ullevål Hospital, 1974–1981. 39 patients died during the observation period, and were excluded from the study. The remaining 134 hips were analysed. There were 113 females and 21 males, average age 73 years. Median observation time was 5 years. The study is based on hospital documentation and a questionnaire sent to 88 patients with insufficient documentation.

The radiographic criteria for loosening were migration, cement fractures, and radiolucent zones more than 2 mm. 46 prostheses were loose. In 42 hips there were no signs of loosening, radiographically or clinically.

Assuming that the loosening frequency in 46 hips with insufficient data equalled the group with good data, a total of 79 prostheses (59%) were loose.

Symptoms of loosening occurred increasingly from 13 months postop.

Postoperative complications: 7 dislocations, 6 perforations of the femoral shaft, 2 superficial wound infections, 4 deep infections, and 2 late fractures of the femur.

Loosening of both hip components was found in 11 hips, 6 of which were reoperated. 6 had loosening of the acetabular component (4 reoperated) and 29 had loosening of the stem (7 reoperated). 7 patients were reoperated in other hospitals, which gave a total of 24 reoperations.

Table. Clinical results:

		No loosening	Loosening
Pain:	None	21	0
	Slight	19	17
	Severe	2	15
	Pain at rest	0	3
Motion:	Good	22	13
	Slightly reduced	17	21
	Severely reduced	3	9
Gait:	Normal	16	3
	Stick/crutch	22	30
	Walking chair	6	10

In conclusion, 46 (34%) of the 134 analysed hips were registered as loose and 33 (25%) as probably loose, giving a total of 79 (59%) loose hips.

Primary results of the Lord cementless total hip prosthesis

Knut Strømsøe, Per Øsleby & Antti Alho

Orthopaedic Division, Ullevaal Hospital, University of Oslo, Oslo

We evaluated the primary results in 88 patients (70 female and 18 male) operated on with the Lord primary hip replacement in 1983. Their age was 65 (61–70) years (median 1 quartile). The time in hospital was 14 (11–17) days. 46 patients were operated on through an antero-lateral approach, 30 patients through a posterior approach and 12 patients through a lateral approach with an osteotomy of the greater trochanter. The following complications were registered: pneumonia – 4, pulmonary embolism – 1, superficial infection – 1 and deep infection – 1. Further, 8 fissures of the femur occurred during impaction of the femoral component. Fracture with dislocation of the proximal femur occurred once and

was treated with wiring. The greater trochanter fractured in 3 cases. Six dislocations were observed; 3 immediately postoperatively and 3 within 14 months postoperatively. One of them was treated operatively. One loosening of the acetabular component required a reoperation. There was a greater tendency for dislocation using the posterior approach (4 of 6), but the fracturing/fissuring of the proximal femur intraoperatively was more common with the antero-lateral approach (6 of 9). Using a medullary motorized reamer, we have been able to avoid fracturing of the proximal femur while using the antero-lateral approach which is our preference.

The influence of ectopic bone formation on hip function after prosthetic replacement

Astor Reigstad, Merete Brandt & Roger Sørensen

Kronprinsesse Märthas Institutt, Oslo.

To evaluate the influence of ectopic bone on hip function a prospective study of 369 total hip replacements (155 Müller prostheses and 204 ICLH double cups) operated via an anterolateral approach at Kronprinsesse Märthas Institutt in the period 1978–1982 was carried out. At 1 year 3,3 per cent of the hips had developed extensive ectopic bone (grade III and IV), 21,3 per cent had some ectopic bone (grade I and II) whereas 75,4 per cent of the hips had no radiographically visible ectopic bone. Ectopic bone was seen more often in male patients, but the age of the patients did not affect the incidence.

The mean ratings for pain at 1 year follow-up were 5,75, 5,75 and 5,85 respectively for hips with extensive, some and no ectopic bone (n.s.) The corresponding ratings for walking ability were 5,60, 5,52 and 5,42 (n.s.) and for hip motion 4,60, 4,34 and 3,75 ($p < 0,001$). All six motion arcs were reduced in hips with ectopic bone. Reduced motion to a disabling degree (extension $< -5^\circ$, flexion $< 60^\circ$, adduction $< 0^\circ$, and external rotation $< 10^\circ$) was seen in 33,0, 15,6, and 7,7 per cent of the patients with extensive, some and no ectopic bone, respectively ($p < 0,01$).

It is concluded that ectopic bone is of little clinical significance as it is not associated with postoperative hip pain. The reduced hip motion seen in hips with ectopic bone does not impair function seriously in most of the patients.

Hip mobility in arthrosis before and after prosthetic replacement compared to normal controls

Merete Brandt & Astor Reigstad

Kronprinsesse Märthas Institutt, Oslo

The mobility (extension, flexion, abduction, adduction, external, and internal rotation) of 369 arthrotic hips in patients admitted to an orthopaedic hospital for total hip replacement was compared with the mobility of 100 hips in 50 sex and age matched controls. The mean preoperative total hip mobility was 103 degrees. The total hip mobility increased to 122, 145 and 157 degrees, respectively, 3 weeks, 4 months and 12 months after the operation. From 1 year to 5 years postoperatively only a minor increase in total hip mobility was seen (162 degrees). Male patients had less total hip mobility than female patients both preoperatively and postoperatively, whereas no difference was seen either preoperatively or postoperatively between patients younger and older than 70 years. Preoperatively 45 per cent of the hips had reduced hip mobility which significantly impaired function (extension $< -5^\circ$, flexion $< 60^\circ$, abduction $< 0^\circ$, and external rotation $< 10^\circ$) compared to 10 per cent one year postoperatively.

The mean total hip mobility in the control group was 222 degrees, 206 and 228 degrees for male and female controls, respectively. Controls younger and older than 70 years had a total hip mobility of 232 and 207 degrees, respectively. The hip mobility of the control group was less than the estimates of normal hip mobility found in some orthopaedic textbooks.

Hip fractures

Ender nailing of trochanteric fractures

Gunvor Haartveit and Knut Strømsøe

Ringerike Hospital, 3500 Hønefoss

At Ringerike Hospital operation with the Ender nail device has been the method of choice for trochanteric fractures in the elderly. Closed reduction has been carried out on a traction table with an image intensifier, and the type of nail is one with inbuilt anteversion, as recommended by Olerud, and produced by SABA.

100 patients operated by the Ender method between 1981 and 1984 have been studied retrospectively. The investigation is based on the patients' records and radiographs. The fractures are classified according to the AO system. Reduction and position of the nails have been recorded.

The mean age was 77 years (± 12). Two patients expired in the immediate postoperative course. Four cases of thrombosis and 4 of pneumonia were noted. No wound complications were observed.

The type of fracture seemed to be of less importance to the result than observed with the CC-nail, in so far as the Ender device seems to be useful in unstable fractures (lack of medial buttress).

The position of the nails in relation to the subchondrium appears to be more important than the frontal or axial position in the femoral neck and head.

The main problem was pain at the knee, which in 14 cases required removal of the nail after the fracture was healed. Three patients required reoperation with exchange of nails that had perforated the acetabulum. In 2 cases reoperation with arthroplasty was carried out, one of these because of pseudarthrosis, the other for correction of a secondary varus displacement. (In total, 19 patients were reoperated).

Conclusion: Operation with the Ender nail appears to be a useful method for trochanteric fractures in the elderly. The most common complication is pain at the knee, which in most cases is corrected by a minor procedure, i.e. removal/exchange of the nail(s). We find a mortality rate of 2% in this high age group remarkable and also that no wound complications have been reported. We ascribe the few general complications to the rapid mobilisation and weight-bearing which this method allows. Further improvement of the results seems obtainable by increased technical accuracy in the application of the method.

The distribution of hip fractures after removal of osteosynthesis material from previous hip fractures

Vilhjalmur Finsen & Pál Benum

Department of orthopaedic surgery, Trondheim University Hospital, N-7000 Trondheim

Earlier studies have shown a significantly reduced frequency of fractures in a previously fractured hip compared to the opposite side. In order to determine whether this was due to protection of the fractured hip by the osteosynthesis material 99 patients over the age of 50 years who had had the osteosynthesis material removed were studied from the time of removal until refracture, reoperation or death – a total of 630 patient-years. There were 17 second hip fractures, but only 2 of these were on the previously affected side. One was a subtrochanteric fracture through a screw hole.

It was concluded that the protection of the previously fractured hip from refracture is not due to the inserted osteosynthesis material. It may be due to increased strength in the fracture area from the healing process. The implant may safely be removed once the fracture has healed.

The distribution of second hip fractures

Vilhjalmur Finsen & Pál Benum

Department of orthopaedic surgery, Trondheim University Hospital, N-7000 Trondheim

A group of 151 patients who were treated for various types of fractures, and who all had a history of a previous hip fracture, was studied. The incidence of present hip fracture in this group was approximately 13 times higher in women and 60 times higher in men than that expected from age-corrected incidence figures for the general population. The subgroup with present hip fractures had few second fractures on the same side as the previous fracture. It was calculated that a hip fracture reduces the risk of subsequent hip fracture on the same side to 1/4th and cervical fractures reduce this risk to 1/6th. A tendency was found for the subsequent hip fracture to be of the same type as the previous one. The time between first and second hip fracture was twice as long in those who had sustained a cervical fracture as in those who had had a trochanteric fracture. It is suggested that there may be a difference in the aetiology of cervical and trochanteric fractures.

Fractures of the femoral neck in elderly treated with Gouffon screws

Torstein Husby, Lars Nordsletten, Jon Slåstad, Lars Viksmoen, Knut Strømsøe & Antti Alho

Orthopaedic Division, Ullevaal Hospital, University of Oslo

We evaluated a simple osteosynthesis with 3 Gouffon screws in femoral neck fractures in 95 elderly patients, with special emphasis on early redisplacement (within 12 weeks). The patients represented the oldest population (mean age 81 yrs.) Seventy-seven patients were female and 18 were male. Immediate full weight bearing was allowed, and the patients were examined clinically and radiographically one and twelve weeks after the operation.

Nineteen patients (20%) had general complications (10 pneumonia, 3 myocardial infarction, 2 pulmonary thromboembolism, 4 others), and 12 patients died.

Two patients developed deep infection. Twenty-three fractures (24%) redisplaced within 12 weeks, 19 were reoperated, 17 of them with hemiprosthesis, one with total hip replacement and one with Richard's hip compression screw. Lack of impaction of the proximal fragment increased the risk of redisplacement ($p < 0.01$), so did also a low screw angle ($< 135^\circ$) ($p < 0.05$). Screw contact on the calcar femorale and reduction in the lateral view were of borderline significance.

We conclude that the following factors are of decreasing importance in the treatment of femoral neck fractures in the elderly: Type of fracture, reduction, osteoporosis (sex) and metal implant.

Knee arthroscopy

Arthroscopic surgery of the menisci

Paul Lereim & Gisle Uppheim,

Sophies Minde Ortopedisk Hospital, Oslo

During two years, 131 arthroscopic resections of the menisci were performed at our clinic. There were 106 males and 25 females with 103 lesions of the medial and 30 of the lateral meniscus. Pain was the dominating symptom, 36 per cent had a history of true locking of the knee. There were 31 per cent bucket handle ruptures, 31 per cent flap tears, 22 per cent vertical and horizontal tears, 7 per cent degenerative and 2 discoid lateral menisci with rupture.

Postoperative stay in hospital was in average 1,5 days. 55 patients returned to work in average 9 days postoperatively and time to full activity was 12 days in 44 patients according to their records.

New knowledge of the function of the menisci advocates preservation of the remaining, undamaged part of the meniscus inclusive the periphery in bucket handle ruptures.

Arthroscopic surgery saves the patient from pain. From an economic point of view a short postoperative hospitalisation and early return to work is of significance.

Partial resection of menisci by arthroscopy

Tor Ø. Rundén

Dep. of Surgery, Aust Agder Sentralsykehus, 4800 Arendal

Today the traditional resection of menisci by arthrotomy is being replaced by endoscopic methods. We have performed 50 cases in the period 1983-85.

Six females and 44 men were operated, age 36 (19–62) yrs. The same surgeon did all the operations, time 51 (28–70) minutes, including the time for diagnostic arthroscopy. The hospitalisation lasted 1.5 (0–4) days. The postoperative pain treatment was minimal; only 10 patients needed paracetamol in 1–2 doses.

Two patients were treated as out-patients with local anesthesia, with good result. The remaining patients were treated with general or epidural anesthesia.

The patients were checked after 3 weeks, and all completed a questionnaire after 3–9 months. All were satisfied with the result. Their pain was reduced from a mean of 7.5 to 1.5 on a scale 1–10. The results were poorer in patients more than 40 yrs. old who had concomitant intraarticular pathology, the most usual, being arthrosis or ligament instability.

One patient had rupture of the remaining meniscus edge following trauma, 8 weeks after operation, and was re-operated.

The mean time of absence from work was 2.5 weeks.

There has so far, been no operative complication.

Arthroscopy of the knee in juvenile rheumatoid arthritis

Albert Paus & Jan A. Pahle

Oslo Sanitetsforenings Revmatismesykehus,
Akersbakken 27, 0172 Oslo 1

This is a retrospective study. All patients admitted with a diagnosis or a suspected diagnosis of juvenile rheumatoid arthritis (JRA) having an arthroscopy of the knee in the period of 1979 to 1984 are included. The total number of arthroscopies was 49.

Patients with JRA will often be a difficult differential diagnostic problem, particularly in monarthritis. In this study 27 patients had a monarticular complaint, and only 13 patients had 5 or more joints involved.

Preoperative investigations included examination both by a rheumatologist and a rheumatological surgeon. After all preoperative investigations were completed the final tentative diagnoses were JRA in 37 cases, meniscal tear in 2 cases, chondromalacia in 2 cases, osteochondritis dissecans in 2 cases and psoriatic arthropathy in one patient.

In all cases biopsies were taken. A comparison of the macroscopic findings at arthroscopy to the histological descriptions of the biopsies showed a high degree of correlation between the visual findings and the histological findings.

In our study there is a large number of monarticular complaints. Arthroscopy as a part of the investigation is particularly valuable in this group of patients. At arthroscopy intraarticular injuries can be excluded. We can judge destructive changes in cartilage, menisci and ligaments, the amount of pannus growth together with the severity of the synovitis. These are important facts when assessing the indication for synovectomy.

Arthroscopy has become a necessity both as diagnostic tool and for preoperative evaluation of the indications for synovectomy in patients with JRA.

Isolated rupture of the anterior cruciate ligament

Arne Ekeland & Bjørn Olav Thoresen

Orthopaedic Section, Surgical Department,
Ullevaal Hospital, University of Oslo, N-0407
Oslo 4

The incidence of anterior cruciate ligament (ACL) tears has increased dramatically in alpine skiing lately. We have studied the injury mechanism of an isolated ACL rupture which occurred in a 36 year-old female skier during a video-taped slalom race.

The ACL rupture seemed to occur during a vigorous, weighted knee hyperflexion in a back-sitting skiing position. The skier felt a pop in the hyperflexed knee at that time, but was able to ski the next turn which engaged the other leg. When preparing for a new turn engaging the previous hyperflexed knee, she lost control and fell over. Immediate arthroscopy and arthrotomy revealed an isolated complete ACL rupture.

Later studies on three cadaver knee specimens displayed a tense ACL in the hyperflexed knee, and the dorsal musculature seemed to act like a fulcrum in this position.

It is proposed that weighted knee hyperflexion may cause isolated tears of the ACL.

Lower extremity

Shelf operation with use of an osteochondral transplant from the iliac crest

Pål Benum & Ole Fretheim

Orthopaedic Department, Trondheim University
Hospital, 7000 Trondheim

Experimental studies in dogs have previously shown

that the apophyseal cartilage of the iliac crest survives transplantation to osteochondral defects of joints. Furthermore, the most superficial parts persist as cartilage even at the time where ossification normally should have taken place (Benum 1974). Based on these experiments an osteochondral fragment of the iliac crest was used as an acetabular shelf in a dysplastic hip of a 14 year old boy. Two years after the operation good function of the hip was found. Radiographic examination showed that the osseous part of the reconstructed anterolateral part of the acetabulum was congruent with the femoral head. Arthroscopy was performed in connection with the removal of the fixating screws. A smooth cartilage surface was seen under the transplant, level with the adjacent part of the acetabulum.

It seems reasonable to try out further the use of osteochondral transplants from the iliac crest in dysplastic hip joints in children where shelf operations are indicated.

Ref: P. Benum (1974) Autogeneous transplantation of apophyseal cartilage to osteochondral defects of joints. An experimental study in dogs. *Acta orthop. scand. Suppl.* 156.

EX-FI-RE external fixation in treatment of tibial shaft fractures

Per Helland & Nils Jacob Andersson

Fylkessjukehuset i Ålesund, N-6017 Åsestranda.

In one year all tibial shaft fractures in adults were treated with EX-FI-RE external fixation. Of the consecutive twelve cases available two had unbroken fibulae, five had indirect trauma, and seven high energy trauma from traffic accidents, mainly motorcycle accidents. Eight fractures were comminuted and none were segmental. Five cases had open injuries; three degree II and two degree III.

All cases were exactly reduced using the correction unit, but this was delayed by an average of six day in eight cases. Changes to the fixation unit and longitudinal release was undertaken at different times in all patients, and full load-bearing was commenced early. One patient got a superficial infection.

Healing time to full unprotected weight bearing was 12.3 weeks. One patient has limited ankle joint movement. No malunion.

Fractures of the neck of the talus

Erik Trondsen & Lars B. Skogland

Sentralsykehuset i Akershus, 1474 Nordbyhagen.

1972–1984 20 patients with fractures of the neck of the talus were admitted to the surgical department, Sentralsykehuset i Akershus. Twelve patients had been involved in motor vehicle accidents. According to the classification of Hawkins, there were 7 type I, 7 type II and 6 type III fractures.

All type I and 2 type II fractures were immobilized in a non-weight-bearing cast as the only treatment, whereas 13 fractures were treated by closed (3) or open (7) reduction before cast immobilization and 5 fractures by open reduction and internal fixation. One patient was treated by primary arthrodesis.

Information about the primary result of treatment could be found in the case histories and radiographs of all but 2 patients. In addition, 14 patients were re-examined clinically and radiographically after a mean follow-up time of 6.5 years.

All type I fractures healed within 12 weeks and within 15 weeks a total of 14 fractures had healed. Two patients developed a *pseudarthrosis* and 3 patients (type III) developed avascular necrosis.

The follow-up examination revealed post-traumatic osteoarthritis in 7 patients. The 4 type I and 2 of the 4 type II fractures were clinically and radiographically normal at follow-up. All 5 patients with type III fractures in the follow-up group, had some degree of arthrosis and/or avascular necrosis.

Various

Treatment of diaphyseal fractures in adults in Norway

Olav Røise & Antti Alho

Orthopaedic Division, Ullevaal Hospital, University of Oslo, Oslo

A questionnaire study was performed on the orthopaedic and surgical departments treating fractures in 1985. The study covers 85% of all beds. The departments are divided into large (1), medium (2) and small (3). The treatment of closed humeral fractures is functional bracing in 85–95% of the cases with least operative activity in Group 1 hospitals. 60–75% of the fractures of radius or ulna and 50% of the fractures of both are treated non-operatively. Plate osteosynthesis is the dominant operative method. Treatment of closed femoral fractures is operative in 90% of all cases, 50% of Group 1 hospitals use plates as alternative to intramedullary nailing (IMN), while 80% of Group 2–3 hospitals do so. IMN is used in all Group 1–2 departments and in 80% of Group 3 hospitals. Locked IMN is as common in Group 1 as the non-locked variant, while 22% of Group 2 and 13% of Group 3 use locked IMN. Treatment of closed

tibial fractures is non-operative in 80% of cases in Group 1 and always functional bracing, while 35% of fractures are operated in Group 2 and 60% in Group 3. Functional bracing is used in 50% of Group 2-3 hospitals. In operative treatment, IMN dominates in the large departments and plates in small ones. Grade II-III open fractures are mostly treated with external fixation except for femoral fractures where the methods vary. In conclusion, certain trends are found reflecting the development of fracture care.

Intra-articular changes in recurrent shoulder dislocation. An arthroscopic study

Helge Lilleby

Diakonissehusets sykehus, Lovisenberggt 17, Oslo 4

34 patients with recurrent shoulder dislocation were examined arthroscopically. 11 had recurrent subluxation, one with posterior subluxation. One patient had multidirectional instability.

Hill-Sachs and Bankart lesions were present in all shoulders with anterior dislocation. Similar changes were found in posterior dislocation, but in inverted position. The instability could be studied arthroscopically during provocation tests.

The arthroscopic recognition of lesions typical for recurrent shoulder dislocation, especially radiographically negative chondral and labrum lesions, makes the diagnosis of recurrent shoulder subluxation easy. In the patient who is unaware of the subluxation, arthroscopy may be the only way of diagnosis.

The direction of a recurrent dislocation is determinable arthroscopically, and the different components of multidirectional shoulder instability can be studied, adding important information for the treatment.

Results of operative treatment for degenerative lumbar spinal stenosis

Terje Nord

Dept. of Surgery, Hedmark Sentralsjukehus, N-2400 Elverum

The results from a retrospective study of 61 patients treated operatively for degenerative lumbar spinal stenosis, are presented.

According to the definition of Sortland and co-workers (1), 32 of the patients were classified as having marked stenosis on at least one level, as demonstrated by functional radiculography.

Through laminectomies, medial facetectomies and foraminotomies, decompression of the dural sac and the lumbar roots at the desired levels, was achieved.

As to reduction of symptoms from the back and lower extremities, and increased walking capacity postoperatively, 82% of our patients were rated as having excellent or good results. The prognosis seemed especially favourable for individuals with a short walking distance and radiographically a marked degree of stenosis. Age, sex or duration of symptoms seemed to bear no significant influence on the final results.

Postoperative complications were registered in four cases, all non-lethal.

Four patients were reoperated, two of these with revision of the decompression, and two with fixation, all with unsatisfactory results.

More investigation in this field is needed to analyse whether the few patients who do not benefit from the operation, are the results of bad patient selection, or from insufficient operative strategy or technique.

- Sortland O, Magnæs B, Hauge T. Functional myelography with metrizamide in the diagnosis of lumbar spinal stenosis. *Acta Radiol (Suppl)* 355: 42-53, 1977.

Vascularized osteocutaneous graft from the iliac crest

Karl R. Hetland, Svein Waage & Astor Reigstad
Kronprinsesse Märthas Institutt, Oslo

Since October 1983 four patients have been treated by transfer of a combined bone and skin graft from the iliac crest using a microvascular technique. Three patients had an infected open pseudarthrosis of the tibia with a large bone defect. The non-unions healed in all three patients, in two of them we had to remove the skin of the graft during the healing period because of a very thick subcutaneous fat layer. The grafted area was covered by a split skin graft. One patient had a large traumatic defect of the radius, the extensor muscles and the skin of the right forearm grafted. A partial necrosis of the grafted skin occurred and was excised and covered by a split skin graft. The transferred bone healed and bridged the 6 cm long radial defect. It is concluded that transfer of a vascularized iliac bone graft is a reliable method for bridging large bone defects with or without infection. However, the thickness of the overlying skin of such a graft may create prob-

lems in fat patients, especially when a tibial defect is to be transplanted.

A free scapular flap for covering large skin defects

Karl R. Hetland & Astor Reigstad

Kronprinsesse Märthas Institutt, Oslo

In 1980 dos Santos developed a free skin flap in the scapular region nourished by a direct cutaneous branch of the circumflex scapular artery which passes through the triangular space bounded superiorly by the teres minor, inferiorly by the teres major and laterally by the long head of the triceps muscle. In 1985 we have treated three patients with a free scapular flap. A 18 year old man had a serious avulsion injury of his left distal leg and foot with a comminuted open fracture of the fibula, an open ankle joint injury and a dislocation of the foot. Primarily all devitalized tissue was excised and the dislocation was reduced and stabilized. Two days later a 9×24 cm free scapular flap was transferred to the defect with anastomosis to the anterior tibial vessels. The flap healed completely and the patient was able to walk with full weightbearing 6 weeks after the injury. The second patient was a 28 year old man who had been treated with recirculation after subtotal amputation of his left foot. The distal part of the foot recovered, whereas a deep necrosis developed at the amputation region which had been heavily crushed by the blunt trauma. After excision of the necrotic tissue the defect was covered by a 12×25 cm free scapular flap which to our knowledge is the largest scapular flap reported in literature. The flap healed completely providing the foot with skin of good quality. The third patient was a 34 year old woman who suffered of unstable skin and a necrotic ulcer of her lower left leg. A 9×14 cm free scapular flap was used for the reconstruction which healed completely. We conclude that the free scapular flap is a very applicable skin flap with uniform thickness and large surface dimensions. The flap is easy to isolate, it has a long vascular pedicle with large external vessel diameter, and the donor site morbidity is minimal.

Axillary plexus block by the catheter technique

Roger Sørensen & Astor Reigstad

Kronprinsesse Märthas Institutt, Oslo

Axillary plexus block by a flexible, disposable intravenous catheter was described by Selander (1977). The cannula is inserted obliquely through the skin at the level of the insertion of the pectoralis major muscle. A "snap" is felt when the cannula perforates the neurovascular fascia. Well inside the sheath the stylet is arrested and the blunt plastic catheter introduced to its full length. The catheter method offers the possibility of a continuous axillary block which is advantageous in replantation surgery and other long lasting operations of the upper extremity. To avoid vasoconstriction we have used an anaesthetic agent without epinephrine; usually bupivacaine or mepivacaine. The injections have been repeated during the operation and postoperatively, providing effective anaesthesia, vasodilatation and postoperative pain relief.

The scapho-capitate fracture syndrom

Astor Reigstad & Karl R. Hetland

Kronprinsesse Märthas Institutt, Oslo

A case of the very rare combination of a fracture of the scaphoid and capitate bones is reported. The injury was caused by a high-energy trauma. The proximal fragment of the capitate had rotated 180 degrees volarly with the typical radiographic appearance like the cut-off top of an egg. In literature open reduction and osteosynthesis are recommended. Via an oblique dorsal incision from the tabatière to the radial border of the ulnar head both fractures were reduced. The capitate was stabilized by two K-wires and the scaphoid with a compression screw. Postoperatively, the patient had plaster-of-Paris for 12 weeks. After removal the radiographs revealed healing of both fractures.