

# Norwegian Orthopedic Society

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## Editor: Arne Ekeland

Orthopedic Service  
Surgical Department  
Ullevål Hospital  
N-0407 Oslo, Norway

The Norwegian Orthopedic Society held its spring meeting in Lillehammer, in eastern Norway, between May 4 and 6, 1989. The spring meetings are arranged every second year alternating with the assemblies of the Scandinavian Orthopedic Association, which also occur at this time of the year. Lillehammer is a middle-sized town situated in scenic surroundings 180 kilometers north of Oslo. The town will also host the Olympic Winter games in 1994. The meetings in Oslo were regional for eastern Norway.

The orthopedic papers presented considered experimental orthopedics, fractures, knee, ultrasonography, and other miscellaneous topics.

## Experimental orthopedics

### In vivo and in vitro deformation of rat femur at different ages

Kari Indrekvam, Otto Schnell Husby, Nils R. Gjerdet, Lars B. Engesaeter and Norvald Langeland

Surgical Research Laboratory, Haukeland Hospital, N-5021 Bergen, Norway

Our knowledge about mechanical properties of bone is mostly based on in vitro testing. This study was designed to establish a platform for in vivo recordings of deformation (strain). A comparison between strain recordings and conventional in vitro biomechanical properties was performed.

**Material and methods:** In vivo peak strain was recorded from strain gauges on the anterior surface of the femoral diaphysis of 6-, 12-, and 52-week-old rats running on a treadmill. In vitro 3-point bending test was first performed within the elastic deformation range with recording of strain, and then until fracture occurred, with recording of deflection. Stiffness was calculated from the usual load/deflection curve and from load/in vitro strain and body weight/in vivo strain ratios.

**Results:** In vivo peak strain was significantly reduced for the 52-week-old rats compared with the 6 and 12-week-old animals ( $P < 0.01$ ). Stiffness increased with age. In vivo and in vitro strain used for stiffness calculations correlated signif-

icantly ( $P < 0.01$ ). Stiffness increased with age. In vivo and in vitro strain used for stiffness calculations correlated significantly ( $P < 0.01$ ). A similar correlation was obtained for stiffness calculated from strain related to stiffness calculated from a conventional bending test.

**Conclusions.** 1. In vivo strain recordings revealed stiffer bone in old rats compared with younger animals. 2. In vivo strain recordings showed a significant correlation with in vitro measurements. 3. In vivo and in vitro strain recordings may be used for stiffness calculations.

### Effect of continuous subcutaneous infusion of somatomedin C on experimental bone repair

Ole J. Kirkeby and Arne Ekeland

Institute of Surgical Research, University of Oslo, Oslo, and Sophies Minde Orthopedic Hospital, Oslo, Norway

Somatomedin C is a growth factor for mesenchymal stem cells in vitro. This peptide hormone also stimulates mitosis and differentiation of primitive chondroblasts and osteoblasts in vitro, and increases matrix formation. In vivo, the proliferation and differentiation of osteogenic cells form the basis of bone repair. Thus, there is substantial theoretical support for the hypothesis that somatomedin C might enhance this process. We have therefore studied the effect of continuous systemic infusion of somatomedin C on bone repair in a rat model.

**Material and methods:** A total of 19 adult Wistar rats (450–500 g) were operated on. The right femur was osteotomized followed by intramedullary nailing. An osmotic minipump delivering somatomedin C (110  $\mu\text{g}/100 \text{ g/day}$ ) or placebo was positioned subcutaneously. All the animals were killed 4 weeks postoperatively.

**Results:** There was no effect on torsional strength in the treatment group as compared with controls. Radiographic healing was similar in both groups. Neither was there any effect on callus vascularization or mineralization. The weight of the callus was significantly smaller in the somatomedin-

treated animals compared with controls. The result does not suggest that systemic administration of somatomedin C promotes the early phase of diaphyseal repair in long bones.

## Fractures

### Hip fractures in Oslo 1988: An epidemiologic survey

Trine S. Kaastad and Jan A. Falch

Department of Surgery, Ullevål Hospital, and Department of Medicine B, Aker Hospital, Oslo, Norway

The age- and sex-specific annual incidence of hip fractures is still rising in Oslo. With the population at risk of December 31, 1987, we would expect 1,156 hip fractures in 1988 if the incidence of 1978–79 was unchanged. We wished to follow up the survey of 1978–79 (Falch et al. 1985), and are now systematically registering all the new hip fractures of Oslo inhabitants.

As of April 28, 1988, we had registered 1,351 new hip fractures and still lacked data from 120 patients. Women sustained 1,071 (79 percent) and men 260 (21 percent) of the fractures, and the mean and median ages were 80/81 and 74/77 in women and men, respectively. In women, 61 percent of the fractures were cervical and 39 percent trochanteric; in the men, 58 percent were cervical and 42 percent trochanteric. The only group with a higher incidence of trochanteric than cervical fractures was that with women older than 90 years. Fourteen percent of the women and 8 percent of the men had had hip fractures previously.

The annual incidence of hip fractures per 10,000 in 10-year age groups from aged 50 years upwards showed unchanged values for both women and men as regards cervical and trochanteric fractures for the ages 50–59 and 60–69. A small increase was seen from ages 70–79, and both women and men over aged 80 years had a significant increase in age-specific incidence of both cervical and trochanteric fractures.

#### Reference

Falch J A, Ilebekk A, Slungaard U. Epidemiology of hip fractures in Norway. *Acta Orthop Scand* 1985;56:12–16.

### Fracture of the proximal end of the femur: Epidemiologic aspects

P. T. Nilsen, L. B. Engesæter, L. Stangeland, S. Seime, A. Bøe and G. Øverland

Department of Orthopedics, Haukeland University Hospital, N-5021 Bergen, Norway

The charts of 2,018 patients with a fracture of the upper end of the femur, operated on between 1977 and 1985, were re-

viewed.

Seventy-seven percent were women. In the group below 50 years of age less than 50 percent, between 75 and 90 years 83 percent, and above 90 years 77 percent were women. The percentage of women in the population is increasing with age, but relatively less than in our patients.

The median age was 79 years. This increased by 1 year during the 9-year period observed.

The fractures were divided into cervical, trochanteric, and subtrochanteric fractures: 60, 35, and 5 percent, respectively. The percentage of subtrochanteric fractures was the same in all the age groups. The percentage of cervical fractures decreased with increasing age. Thus, the ratio pertrochanteric/cervical fractures increased from 0.27 (age below 50) to 0.91 (age above 90).

Sixty-seven percent of our patients sustained their fractures at home (inside). Even in the age group below 50, 30 percent of the accidents occurred indoors. Most of these fractures occurred during winter, e.g., in January (246, the highest number), and they were sparse during summer, e.g., August (112, lowest number). The increase in the fracture rate during winter was mainly due to an increase of outdoor accidents.

The mean hospitalization time was 17 days, but the last year observed (1985), it was only 11 days. Postoperative infections occurred in 3.3 percent of the patients. Totally, 20 percent were reoperated on.

### Telescoping of intertrochanteric and subtrochanteric femoral fractures treated with hip compression screw

Arne Ekeland, Jan Benterud, Knut Strømsøe and Antti Alho

Orthopedic Service, Department of Surgery, Ullevål Hospital, University of Oslo, Oslo, Norway

Unstable trochanteric fractures treated with a hip compression screw (HCS) may telescope considerably, with shortening and medial displacement of the fractured limb. This has been studied in some cases where the lateral support for the proximal fragment was weak or nonexistent.

*Patients and method:* The median age of the 10 patients was 72 (41–99) years. Eight had intertrochanteric and 2 subtrochanteric unstable fractures. Seven fractures were transverse or short oblique at the level of the HCS. In the three others, a thin lateral tongue of the distal fragment fractured during insertion of the HCS.

*Results:* The immediate postoperative radiographs disclosed a shortening of 16 (0–31) mm and a medial displacement of the distal fragment of 11 (0–27) mm. After a follow-up time of 19 (2–37) months, an additional telescoping of 11 (0–37) mm was measured on the HCS. The limb shortening measured clinically was 2 (1.5–2.5) cm. Two fractures were reoperated on; the others healed. About half of the patients had hip and back pain and considerably reduced activity at follow-up.

*Conclusion:* HCS are popular in the treatment of trochanteric fractures. In cases with weak or nonexistent bony support for the proximal fragment, other operative methods may be preferable to avoid undesirable telescoping at the fracture site.

## Interlocking nailing of the femur and tibia: A review of 194 operated on fractures

G. Follerås, A. Ekeland, K. Strømsøe, B. O. Thoresen and A. Alho

Orthopedic Service, Department of Surgery, Ullevål University Hospital, Oslo, Norway

Totally, 194 fractures treated with interlocking nailing (Grosse) were reviewed. There were 115 males and 79 females. Of the fractures, 110 (56 percent) were caused by traffic accidents, whereas 116 (60 percent) resulted from high-energy trauma. One hundred and twelve patients had a single fracture; the rest had other accompanying injuries. Forty-four (23 percent) were multitraumatized. In 178 (92 percent) a closed nailing was performed. Totally, 105 fractures were judged to be able to carry full weight, of which 89 could tolerate exercises without additional external supports. The median observation time was 22 months.

*Results:* The median time to full weight bearing was 45 days. One hundred and sixty-six (85 percent) fractures had no postoperative complications. Four patients (2 percent) had a deep infection, 3 a superficial infection, and 2 had a hematoma. The median time off work was 13 weeks. At evaluation, 140 patients (72 percent) had no pain, 52 (27 percent) had slight pain, and 2 had severe pain. Working ability was unchanged in 141 (73 percent), reduced in 44 (22 percent). One hundred and ninety-one (98 percent) had a radiographically healed fracture and 3 patients had a nonunion.

The following angular deformities were recorded: varus  $> 5^\circ$  12 legs, valgus  $> 5^\circ$  12 legs, valgus  $> 5^\circ$  12 legs, recurvation  $> 5^\circ$  13 legs, antecurvation  $> 5^\circ$  9 legs. External rotation  $> 5^\circ$  was noted in 19 legs and internal rotation  $> 5^\circ$  in 6 legs. The result was classified as excellent/good in 162 (83 percent), fair in 28 (14 percent), and in 4 poor.

*Conclusion:* Interlocking nailing is a good method for treating shaft fractures of femur and tibia. The number of complications is acceptably low, and the angular and rotatory deformities are mostly minor and of little significance.

## The comminuted fracture of the calcaneus: A more aggressive operative approach?

K. Strømsøe

Orthopedic Service, Department of Surgery, Ullevål Hospital, University of Oslo, Oslo, Norway

The two main goals in the treatment of the fractured calcaneus have been the reconstruction of the subtalar articular surface and the reconstruction of the tuber angle. In comminuted fractures the results have not been reproducible as in the two or three fragment fractures, and thus the attitude concerning operative treatment of this type of fracture has been nihilistic.

*Patients and methods:* Six patients with seven comminuted fractures of the calcaneus were treated operatively during the last 2 years. The routine approach was a curved lateral incision around the apex of the lateral malleolus towards the calcaneocuboid joint. Only once a medial additional incision was necessary to reduce the sustentaculum tali and the anterior structure in the axis of the "hindfoot." The osteofixation was done by an AO cervical-spine plate. Bone grafting was performed regularly.

*Results:* The primary results have been promising. Four patients are back at work, 1 patient works halftime after 8 months. One patient is incapacitated owing to multitrauma, and the last patient is retired, but bore full weight on the operated on foot after 43 months. No disturbance of the wound healing was noticed.

*Conclusions:* The long-term results have to be observed. The reconstruction of the normal configuration of the calcaneus will, however, even if a later subtalar arthrodesis has to be performed makes this operation more easy than with a deformed calcaneus. This, and the fact that the patient can use normal shoes, has convinced us that even in comminuted fractures of the calcaneus, operative treatment should be considered.

## Interlocking intramedullary nailing of displaced tibial fractures

Arne Ekeland, Antti Alho, Knut Strømsøe, Gunnar Follerås and Bjørn Olav Thoresen

Orthopedic Service, Surgical Department, Ullevål Hospital, University of Oslo, Oslo, Norway

Tibial shaft fractures are usually treated conservatively. But some displaced fractures may need operative treatment to retain the fracture position and secure a good functional end result.

*Patients and methods:* During the period 1979–1986, 98 displaced tibial fractures in 94 patients were treated with locked intramedullary nailing. The median age was 35 (16–83) years. About half of the fractures were due to high-energy trauma, and 28 percent of the patients were multitraumatized. Twenty percent of the fractures were comminuted, 19 percent were compound (grades I and II), and 8 percent were segmental. Static nailings were performed in 39 percent and dynamic nailings in 61 percent of the patients. The median operation time was 65 minutes, and 95 percent were closed nailings.

*Results:* The median time to full weight bearing was 40

days, and the median time to radiographic fracture healing was 15 weeks. Eighty-six percent of the fractures healed without shortening, and 10 percent had a shortening of 1 cm. The number of angular malalignments was small. One delayed union and two nonunions occurred in the series, and the infection rate was 5 percent (two deep and three superficial infections).

After a follow-up time of 22 (12–97) months, the result of 93 treated fractures was graded as excellent in 62 percent, good in 24 percent, fair in 12 percent, and poor in 2 percent. The patients with an infection recovered, and they all had an excellent or good final result.

*Conclusion:* Our experience with locked intramedullary nailing was good in this selected material of tibial fractures, which in a high percentage were due to high-energy trauma in multitraumatized patients.

## Knee

### Poor short-term results of the nonoperated on, isolated anterior cruciate ligament tear

L. Engebretsen and A. Tegner

Department of Orthopedics, Trondheim University Hospital, N-7006 Trondheim, Norway

Reports after nonoperative treatment of isolated ACL injuries have shown variable results. The majority of the studies have reported on selected groups of patients that have been hospitalized owing to pain and chronic instabilities. The purpose of this study was to investigate the short-term results of nonoperative treatment of acute, isolated ACL tears, and to define a rationale for treatment selection in acute ACL injuries.

*Patients and methods:* From 1984 through 1987, 29 patients presenting with knee pain and swelling had an examination under anesthesia, and an arthroscopy was carried out. The ACL tear was diagnosed by arthroscopy. Nine patients with meniscal injuries were treated arthroscopically with resection of the injured part. The patients were followed with yearly controls with the Tegner activity level scale, Lysholm functional score, clinical and instrumental stability testing (KT1000), and muscle strength testing using the Cybex II dynamometer.

*Results:* Of the 29 patients, 11 required ligament reconstruction in the follow-up period due to considerable knee instabilities. The mean time from injury to reconstruction was 24 months. The average age in the reconstructed group was 22 years. The preinjury activity level in the reconstructed group was high (Tegner 8). All 11 patients participated in organized sports, with 2 high-level downhill skiers and 3 major league team handball players. The patients all expressed a strong desire to return to their former activity level in sports. However, at the 1-year follow-up, the average activity level was 4, allowing only recreational jogging and biking. The

functional score in this group at the time of reconstruction was 69, with only 1 patient scoring above 80. Their main complaints were recurrent giving-way feeling and pain during sports. All the patients had a 2+ Lachman and a clearly visible pivot shift. Further, all the patients had achieved at least 85 percent of their normal quadriceps and hamstring strength.

The average age of the nonreconstructed group was 27. The average follow-up in this group was 33 months. The pre-injury activity level was in general lower than in the reconstructed group. After their injury the patients had gone from low-division and recreational contact sports to running and cross-country skiing. The functional score was 84, significantly higher than in the reconstructed group. All but 1 occasionally had some form of instability feeling during sports activity. All but 4 had some pain, and all but 2 patients had a 2+ Lachman and pivot shift. Four patients were not considered fully rehabilitated according to the Cybex results.

*Conclusion:* The nonoperated on group seemed to achieve adequate function through a decrease in activity level. A young patient in a knee-demanding profession or insisting on continuing knee-demanding sports should have an acute, augmented repair or an early reconstruction carried out.

### A case of rupture of the rectus femoris tendon

Pål Benum

Department of Orthopedics, Trondheim University Hospital, N-7006 Trondheim, Norway

Total rupture of the distal tendon of the rectus femoris muscle is a rare condition. The diagnosis of this lesion is often missed in the acute stage. If a loss of quadriceps strength of 20–25 percent is found unacceptable, primary suture should be considered. However, postoperative immobilization in POP, which is commonly recommended, leads to a considerable loss of function for several months and may result in a permanently reduced flexion mobility of the knee. Based on the experience in a single case, a more functional aftercare is advised. After repair of the rupture, with multiple interrupted sutures under local anesthesia, active and passive mobilization were allowed. Care was taken not to flex the knee beyond the limit at which the patient experienced painful stretching of the muscle-tendon complex. A protective hypotonia of the rectus femoris muscle was found during the first 4 weeks. Hence, full weight bearing could be allowed. However, descending stairs in a normal way was not allowed until 3 weeks postoperatively. Cross-country skiing was performed from the second postoperative day. During the first 10 days, an orthotic device prevented bending of the knee during this activity, but bending to 80° was allowed the following 2 weeks. Jogging without the orthotic device was started at 4 weeks.

This functional way of aftercare gave a nearly complete restoration of function of the knee 6 weeks after the operation.

## Ultrasonography

### Ultrasound for measurement of leg length

Terje Terjesen, Pål Benum, Svein Svenningsen, Anne E. Fløystad, Turid Nordbø and Ivar Rossvoll

Department of Orthopedics, Trondheim University Hospital, N-7006 Trondheim, Norway

Leg-length inequality can be reliably measured by various radiographic techniques. A disadvantage is, however, the exposure of the patient to radiation. Thus, nonionizing techniques are desirable, and the aim of this study was to evaluate whether ultrasound is suitable for leg-length measurement.

**Patients and methods:** The length of both legs was measured by real-time ultrasound (5 MHz linear transducer) in 30 patients, 10–47 years of age, admitted for leg-length inequality. A holding device for the transducer was made in order to keep the transducer stable in the horizontal position. The transducer was moved up and down with a crank. With the patient in the erect posture, transversal ultrasound scanning from the anterolateral aspect was employed. The femoral head was recognized, and the transducer was raised until the contour of the most proximal part of the femoral head was seen on the monitor screen. This level (the distance from the floor) represented the leg length, which was read on a scale. In order to assess the accuracy of the method, leg-length inequality was also determined by erect posture anteroposterior radiography of the pelvis and spine.

**Results:** The mean radiographic leg-length inequality was 18.8 (1–44) mm. Compared with radiography, the inequality in leg length was greater by ultrasound in 11 patients, identical in one, and less in 18 patients. The average discrepancy between ultrasound and radiography was 3.6 (0–9) mm, and there was a high correlation between the two methods ( $r = 0.95$ ).

**Conclusion:** Measurement of leg length by ultrasound is a relatively simple technique if a special device to hold and move the transducer is used. The results by ultrasound correlated well with those of radiography; thus, ultrasound seems to be a reliable method for leg-length measurement in clinical practice.

### Measurement of femoral anteversion by ultrasound and radiography—an anatomic study

Terje Terjesen, Svein Anda, Sverre Sundalsfoll and Åse Tangerud

Departments of Orthopedics and Radiology, Trondheim University Hospital, N-7006 Trondheim, Norway

There is at present no consensus with regard to the reliability of ultrasound measurement of femoral anteversion (AV). The purpose of the present study was to assess the accuracy of our ultrasound technique by comparing it with radiographic measurements.

**Material and measurements:** In 20 dry, adult femora, the AV angle was measured by ultrasound as the angle between the posterior tangential plane of the femoral condyles and the anterior tangent of the femoral head and the greater trochanter (head-trochanter tangent). Real-time ultrasound with a 5 MHz linear transducer was employed. The transducer was tilted until the head-trochanter tangent was horizontal on the monitor screen, and the angle of tilt was measured with an attached clinometer. The angle of the head-trochanter tangent was also measured by radiography. The real AV angle was determined by biplanar radiography.

**Results:** A high correlation between the head-trochanter angles measured by ultrasound and radiography was found ( $r = 0.97$ ). The correlation was also high between the AV angle by ultrasound and the real AV angle by radiography ( $r = 0.95$ ). However, the AV angle by ultrasound (the angle of the head-trochanter tangent) was always larger than the real AV angle; the mean discrepancy was 8.7.

**Conclusion:** Measurement of femoral anteversion by ultrasound, using the head-trochanter tangent as the reference line, seems to be a reliable technique. In adults the real AV angle is obtained by subtracting  $10^\circ$  from the angle of the head-trochanter tangent by ultrasound. The technique of tilting the transducer is recommended.

### Ultrasound and congenital dislocation of the hip

L. B. Engesæter<sup>1</sup>, D. Nag, D. J. Wilson and M. K. D. Benson  
Department of Surgery<sup>1</sup>, University of Bergen, Bergen Norway, and Nuffield Orthopaedic Centre, Oxford, England

During the first weeks of life, 100 newborn children with a high risk of hip instability were assessed clinically and with ultrasound (real-time sector scanner with a 10-MHz transducer). The decision to treat or not to treat was, however, based only on the clinical examination.

At the age of 3 months, all the children were evaluated clinically and with an anteroposterior radiograph of the pelvis. No correlation between the initial standard ultrasound assessments (Graf's types, alpha and beta angles, relative acetabular depth, relative femoral-head cover), and the outcome at 3 months could be detected. The only ultrasound technique that had a significant ( $P < 0.001$ ) relationship with the outcome was the dynamic stability assessment.

### Detection of deep vein thrombosis in the lower extremities by B-scan ultrasonography

Tor Erik Gudmundsen, Bjørg Vinje and Tom Pedersen

Department of Radiology, Buskerud Sentralsykehus, N-3004 Drammen, Norway

In 28 patients with suspected deep vein thrombosis in the low-

er extremity, the diagnostic accuracy of B-scan ultrasonography was compared with contrast venography.

In the area of the common femoral/popliteal vein, ultrasonography was correct in all 28 patients.

Not only is ultrasonography a certain method for diagnosing deep vein thrombosis, it will also reveal other diagnoses that can explain the patient's symptoms.

Ultrasonography can be used as the sole diagnostic method for locating and tracing deep vein thrombosis in the common femoral/popliteal area. On the other hand, we recommend contrast venography after ultrasonography has shown normal conditions when looking for deep vein thrombosis in the calf. In using contrast venography as a supplement, only small doses of contrast are needed to visualize the deep veins from the calf to the popliteal area.

The patient is examined supine. The procedure takes about 10 minutes. The method requires nothing more than the usual ultrasonographic skill that is to be found in any specialized unit. The technique is inexpensive, and it produces no discomfort to the patient.

In conclusion, we claim that ultrasonography is a certain, noninvasive method for demonstrating deep vein thrombosis in the common femoral/popliteal vein area.

## Miscellaneous

### Carpal tunnel syndrome: The effect of decompression before electrophysiologic changes may be recorded

Jan Roar Orlin

Sophies Minde Orthopedic Hospital, Oslo, Norway

Patients with carpal tunnel syndrome (CTS) have experienced pain relief after surgical treatment, but have often been left with permanent paresis. Operation in an earlier phase therefore should be preferred. In this prospective study, 259 hands were operated on based on case history and clinical tests, while electrophysiologic changes were absent in those examined.

*Material and methods:* Totally, 259 hands in 207 patients were operated on using local anesthesia and a 3–4-cm skin incision. Postoperatively, they were encouraged to use the hand the next day. One patient lost sensitivity in the proximal part of the palm corresponding to the ramus palmaris. No other complications were experienced.

Seventy-seven percent were females, and the age profile was lower than in previous publications. Yet, the duration of symptoms was impressive (Table 1).

The earliest sign of CTS in 58 patients was writing problems, a sign of flexor weakness.

*Results:* A follow-up questionnaire was answered by 89 percent (234 hands in 185 patients) after a mean observation period of 14 (6–30) months.

Table 1. Preoperative duration of symptoms in 186 cases.

1 year	1–3 years	3–9 years	10 years
38	44	51	53

Table 2. Symptoms experienced by the patients with CTS

Therapy-resistant muscular pain	Writing problems	Pain at work	Wakes up at night	Drops things	Reduced flexion power
185	58	85	99	101	180

Table 3. Answers to follow-up questionnaire (234 hands, 185 patients)

Satisfied	Gained nothing	Slight deterioration
92.7 percent	6.4 percent	0.9 percent

*Conclusion:* In contrast to conservative treatment, decompression was beneficial to patients with early stage CTS. The results favor the simple surgical procedure used. The operation may even be recommended to school children if writing problems become too distracting.

As a cause of muscular pain, the condition seems more frequent than yet realized.

### Sports accidents in childhood

Ylva Sahlin

Emergency Clinic, University Hospital, N-7006 Trondheim, Norway

Injuries among children during sports activities are common. All the patients admitted to Trondheim University Hospital who had an accident during 1 year were recorded. All patients 5–14 years old with acute injuries from sports activities were selected for this study. In Trondheim the University Hospital is the only hospital and outpatient emergency clinic. These data therefore represent the total number of accidents that came under medical care in this region.

Totally, 2,841 injured children were recorded of which 758 (27 percent) were injured during sports activities. Fifty-three percent of the injured were boys and 47 percent were girls. Boys sustained more severe injuries than girls. Soccer caused the greatest number of injuries. Horseback riding and alpine skiing caused the most severe injuries. Almost half the accidents were collision accidents, but accidents caused by falls resulted in more severe injuries. Ten percent of the children required hospitalization.

A more widespread use of protective guards, improved body control, better coaching, and not allowing the youngest

children to take part in technically advanced sports activities might reduce the number and severity of sports injuries in childhood.

## The chronic osteomyelitis of the leg: A presentation of the technique described by Papi-neau

K. Strømsøe and H. Bjerkholt

Orthopedic Service, Department of Surgery, Ullevål Hospital, University of Norway, Oslo, Norway

In 1970, Papineau described a technique for treating chronic osteomyelitis of the leg. A radical bone resection combined with secondary autologous bone graftings and open aftercare with secondary healing regularly led to healing of the chronic osteomyelitis. With background experience of 2 cases treated with the Papineau technique, we want to recall this valuable method in the treatment of a difficult problem.

**Patients and method:** Two patients with an osteomyelitis after operative treatment of a bicondylar tibial fracture in the proximal part of the tibia were treated with bone resection and Septopal® antibiotic chains for 14 days. Then, an open bone grafting with autologous cancellous bone was performed. In 1 patient, this had to be repeated once; in the other patient, three times. Open treatment with frequent (daily) changes of the bandages and administration of local and systemic antibiotics led to secondary epithelial migration. No skin grafting was necessary.

**Results:** Short, but intensive, stationary care was required for both patients. The functional result was, however, very good, and to date we have not seen any recurrence of the chronic osteomyelitis after the antibiotic therapy was concluded more than 6 months ago.

## Surgical treatment of bone tumors in the pelvis and sacrum

G. Follerås and I. Bjerkreim

Sophies Minde Orthopedic Hospital, University of Oslo, Oslo, Norway

**Patients:** We have treated 8 patients with bone tumors in the pelvic girdle or in the sacrum, all in cooperation with the Norwegian Radium Hospital. The diagnoses were chondrosarcoma (Chs) (*n* 3), osteosarcoma (Os), giant cell tumor (Gct), chordoma, neurilemmoma, and cyst (1 each).

**Results:** One female (39 yrs) had a Chs in the pelvis involving the hip joint. The pelvis was resected, and the ilium and the femur were fused with a shortening of 5 cm. One female (24 yrs) discovered a tumor over the sacrum, and the diagnostic studies revealed a tumor in the roof of the sacral ca-

nal. It was resected without neurologic deficit and proved to be a Chs. One male (55 yrs) had a recurrence of Chs in the pelvis after a previous hip disarticulation, and a hemipelvectomy was performed. A female (34 yrs) had dyspareunia, and she had a large intrapelvic Os originating from the pubis. After pretreatment with methotrexate, the pubis and the tumor were resected sparing the hip joint. Good function afterwards. In a male (72 yrs) with a chordoma in the sacrum, the rectum and sacrum were extirpated, leaving S1, which was not involved. A male (33 yrs) had a cyst (7 x 8 x 3 cm) removed from the iliac wing. A male (20 yrs) had a Gct in the left hemipelvis with a large soft-tissue intrapelvic extension. An internal hemipelvectomy with arthrodesis between the femur and the iliac remnant was performed. A male (20 yrs) had a tumor in the sacrum filling most of the pelvis. It proved to be a neurilemmoma, and could be resected without neurologic deficit.

**Conclusion:** The operations for tumors in the pelvic girdle are difficult, long lasting, and should be centralized.

## Use of peroperative autotransfusion in rheumatologic surgery

Gerhard K. M. Endresen, Jan A. Pahle and Jan Spiechowicz  
Oslo Sanitetsforening Rheumatism Hospital, Oslo, Norway

The so-called Sorensen autotransfusion system represents a simple device designed for intraoperative blood salvage and reinfusion. In our hospital, this system has so far been used in reconstructive surgery of 24 hips and 13 shoulder joints in adult patients suffering from rheumatoid arthritis. All the operations were carried out in regional blockade anesthesia using bupivacain.

It was generally experienced that reinfusion of the collected blood, supplied with saline and albumin solutions could compensate the blood loss, and did not require the addition of banked blood.

No patients manifested any complications. Thus, reactions such as chills or fever, acidosis, serious hemolysis, thrombocytopenia, and evidence of coagulopathy were not encountered.

Preliminary hematologic data of the 37 patients (values expressed as mean  $\pm$  SD) were the following:

	Preoperative	24 h postop
Hemoglobin conc. (g/dL)	11.9 $\pm$ 1.6	10.1 $\pm$ 1.4
Hematocrit level (%)	36.5 $\pm$ 4.4	31.0 $\pm$ 4.1
Red blood cell count (x 10 <sup>12</sup> /L)	4.07 $\pm$ 0.52	3.47 $\pm$ 0.47
White blood cell count (x 10 <sup>9</sup> /L)	7.68 $\pm$ 2.30	8.59 $\pm$ 2.81
Platelet count (x 10 <sup>9</sup> /L)	366.9 $\pm$ 85.8	275.2 $\pm$ 92.2
Hemoglobin in plasma (mg/dL)	5.97 $\pm$ 0.43	6.98 $\pm$ 0.64
Serum creatinine (mmol/L)	91.1 $\pm$ 36.9	77.8 $\pm$ 29.6

Several of the hematologic changes are the result of hemodilution with the anticoagulation solution used in the Sorensen system, and the addition of saline and albumin solutions.

In light of our preliminary experiences with the Sorensen system compared with the use of homologous blood, the So-

rensen system may be considered as an underutilized resource in rheumatologic surgery. The system is first of all simple to set up and use, safe, and cost effective. Also reinfusion of blood collected in postoperative drains may be considered, but most likely this blood is of inferior quality compared with the intraoperative one. In rheumatologic surgery, preoperative collection of autologous blood is rarely possible because of the anemia generally encountered in this group of patients.