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Hip

Hip involvement in juvenile rheumatoid arthritis

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386 children who met the criteria for juvenile rheumatoid arthritis were followed for an average of 90 months. Clinical parameters were pain, range of motion and functional capacity. All were available regularly during observation. 236 of the patient group had hip radiographs available, and data for erosions and hip joint narrowing were evaluated.

It was found that hip involvement in juvenile rheumatoid arthritis will result in a poor functional capacity. The general prognosis for the pauciarticular group is good, but patients with onset over six years of age seem to do worse compared with those under six years of age. Joint space narrowing and erosion are seen in less than five percent in the pauciarticular group. In the polyarticular group, the age of onset was not found to change the prognosis while in the systemic group the group with onset before six years of age had a worse prognosis and more frequent radiographic changes than the older group. Less than 20 percent of patients in the polyarticular and systemic onset group showed erosions and joint space narrowing after five years of disease.

Arthroscopy of the hip

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Arthroscopy has become an important tool in solving diagnostic problems in painful hip disorders, especially in hip disorders not responding to conservative treatment.

The method has also shown to be effective in removal of loose bodies from the hip joint.

The number of patients with the above-mentioned disorders is small, and therefore experiences with hip arthroscopy are few and confined to very few orthopedic surgeons.

The operation is performed under general anaesthesia with the patient placed on a traction table. The anterolateral portal is used, and the scope is introduced guided by an image intensifier; continuous irrigation of the joint is usually used.

As a routine both a 30° and 70° arthroscope are used.

It is our experience that as soon as the arthroscope has been introduced in the joint, great advantage can be taken from releasing the traction and moving the joint. This gives a good overall view of the joint.

Releasing the traction is not described as part of the method in the literature, but we find this part of the examination very important.

The Harris Galante/Müller total hip arthroplasty—a 4–5-year follow-up study

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A clinical and radiographic follow-up study was performed on a consecutive material of 59 patients with 62 hybrid total hip arthroplasties. The 28 men and 31 women in the study had a mean age at the time of operation of 65 (39-82) years. The follow-up time ranged between 45 and 60 months.

All the patients had an uncemented Harris Galante titanium porous coated acetabular cup fastened with two or three screws and with an inset of high density polyethylene. On the femoral side cemented Müller straight stem prostheses were used.

The results of clinical scoring at the time of the follow-up according to d'Aubigné and Postel's six-point score-system showed an average improvement in pain score from 2.1 to 5.6, in walking ability from 2.6 to 5.2 and in range of movement from 3.3 to 5.3.

Radiographic assessment showed signs of definite loosening in one case, as the femoral component had subsided and there was a partial radiolucent zone of 2 mm around the

acetabular cup. There were signs of possible loosening of the acetabular cup in 16 hips, as there was a 1 mm radiolucent zone the whole way around the cup in two cases, half way in six and one third in eight. Heterotopic ossification was seen in seven cases.

It is concluded that the hybrid hip arthroplasty in this study gives excellent clinical results, has an acceptable frequency of complications and low rate of aseptic loosening after four to five years.

Epidemiological studies on total hip arthroplasty in the county of south Jutland, Denmark, in the 1980s

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The incidences of primary total hip arthroplasty (THA) in the County of South Jutland, Denmark, in the 1980s are calculated, and we estimate the national need for THA in Denmark for the 1990s.

Material: All primary THAs inserted for primary or secondary arthrosis in the period 1981-90 at Sønderborg County hospital and Haderslev hospital in the County of South Jutland, are included in the study.

Results: 1752 hips were inserted in 1458 patients during the period, women/men = 757/701, right/left = 937/815. Unilateral THA was performed in 1164 patients, and bilateral in 294 patients. The indication for operation was idiopathic arthrosis in 1507 cases, fractures in 111, rheumatoid arthritis in 53, dysplasia and congenital hip dislocation in 39, and others 42 cases. The overall incidence of of primary THA during 1988-90 was 82/100 000 inhabitants. For the age group >80 the incidence was 226/100 000 inhabitants. The estimated number of primary THA in Denmark might increase from 4054 in 1990 to 4243 in 2000 due to a slight increase in number of elderly people.

In the light of the steady state incidence of THA for idiopathic arthrosis, and an increasing incidence of THA for fractures, and an increasing number of elderly people, the demand for primary THA in Denmark will increase in the 1990s.

Bilateral hip replacement—a simultaneous procedure in 64 patients

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Bilateral total hip replacement as a one-stage procedure was employed in 64 patients during a period of ten years.

Patients submitted to operation were anaesthesiologically evaluated and only patients in good condition were offered the simultaneous operation.

Only a few, and no fatal, complications occurred. There were no deep infections and no dislocations. Additional surgery on the operated hip was required in one patient, because of superficial infection.

The postoperative stay in the hospital was for most of the patients 12–14 days, like for our unilateral hip replacements.

It is concluded that patients with bilateral arthrosis of the hips, in whom the anaesthesiological conditions do not contraindicate a prolonged operation, may be advantageously operated in one session. The course of rehabilitation is shortened considerably and the need of hospital beds is halved.

Fracture of ceramic heads in total hip arthroplasty

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Due to good friction and wear characteristics femoral heads of ceramic have been used in total hip arthroplasty since the mid seventies. From 1979 until 1987 we have used 2000 ceramic heads without any material complications. From 1987 to March 1990 we have performed additionally 300 arthroplasties with ceramic heads. But in this last series we have experienced five cases with fracture of the ceramic head between 15 and 21 months after the operation.

In three of these cases there were no episodes or demands that could explain such a mechanical failure. In one case the patient had a high activity level and in another case there was a minor trauma. The weight of the last two mentioned patients was above average, and at the reoperation we found extensive periarticular calcifications. Analysis by the manufacturer did not give any explanation for the fractures, especially were the cone angles within the required limits.

Because of these mechanical failures reported here, we no longer use ceramic heads in total hip arthroplasties.

Post-operative analgesic treatment in hip fracture patients—a controlled comparison of nicomorphine and morphine

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The use of Nicomorphine (Vilan®) and morphine for postoperative pain in hip fracture patients was compared in a double-blind, parallel group study. The primary study variables were side effects/adverse reactions and dose requirements. The study included 154 patients consecutively admitted and operated for hip-joint-near fracture, 119 women and 35 men, median age 76 (28–97) years. The nicomorphine (n=79) and morphine (n=75) treatment groups were similar with respect to age, sex or type of fracture. Dropouts for protocol compliance reasons etc (n=10) or adverse reactions (n=12) were equally distributed in the two treatment groups. The analgesic effect and dose requirement on mg basis were equal for nicomorphine and morphine. Likewise, side effects such as slight drop in pulse rate, blood pressure and respiratory frequency, nausea and vomiting showed no difference in the two treatment groups. However, there was a significant difference with respect to sedation which was markedly lower in the nicomorphine treated patients. Nicomorphine thus may offer an advantage in these largely elderly patients by increasing the possibility of rapid postoperative mobilization and reducing the risk of confusion.

Survival of primary Charnley THA in patients under age 55

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The aim of this study was to measure the survival of primary Charnley total hip arthroplasty with cement in patients below the age of 55.

From 1976 to 1988, 95 Charnley total hip arthroplasties were performed in 45 women and 27 men. The original cause of hip disease was primary arthrosis in 67% of the cases, rheumatoid arthritis in 14% and secondary arthrosis in 19%.

The observed survival at ten years for the Charnley prosthesis was 85 (75–96)%. The survival in women was 89% and in men 77% ($p < 0.01$). In 15 cases one or both components were exchanged.

The reason for revision was aseptic loosening in 14 cases, three had implant fractures after fall. One arthroplasty was revised because of bone- and implant fracture. There was no case of infection.

At follow-up, 71% were painfree (82% of those not revised). Subsidence of the femoral component, more than 5 mm in ten years, was present in 9%. The linear rate of socket wear was 0.066 mm/year.

In our material the survival of primary Charnley total hip arthroplasty with cement in patients below the age of 55, was 85% at ten years.

Individually dosed codeine plus paracetamol versus paracetamol in long-term treatment of chronic pain due to arthrosis of the hip—a randomised, double blind, multicenter study

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Introduction: As a previous investigation has shown a considerable number of adverse drug reactions to codeine 60 mg plus paracetamol 1 g in a long-term study of chronic pain in patients with arthrosis of the hip, this study was carried out to evaluate the efficacy and safety of the same drugs, but individually dosed by the patient in a three week period, in patients with arthrosis of the hip.

Methods: A total of 131 (61 males and 70 females) outclinic patients entered the study. 64 patients were treated with codeine 30 mg plus paracetamol 500 mg (CP). The average number of tablets taken per day in this group varied from 2.95 to 4.37. 67 patients were treated with paracetamol 500 mg (P). The average number of tablets taken per day varied from 2.78 to 4.33 in this group. The patients were only allowed to take six tablets daily and not more than two tablets within four hours. Eight patients treated with CP and six patients treated with P did not complete the study due to lack of effect.

Results: We are not able to demonstrate any significant differences between the two drugs as to pain intensity, difference in pain intensity, pain relief or the patients' evaluation of the effect of the treatment. Significantly more patients treated with CP reported adverse drug reactions ($p = 0.0005$) but the number of reported adverse drug reactions decreased during the three week treatment period for both drugs. Moreover, no serious adverse drug reactions were reported, these primarily consisting of dizziness, abdominal pain, obstipation and nausea. 15 patients dropped out due to adverse drug reactions, but no significant difference between the two drugs was demonstrated.

Conclusion: No difference between treatment with codein 30 mg plus paracetamol 500 mg and treatment with paracetamol 500 mg alone could be demonstrated in this study. The additive effect of codein must therefore be minor in this group of patients. As the patients treated with the combination of codein and paracetamol also had significantly more adverse drug reactions, this combination cannot be recommended for treatment of patients with chronic pain due to arthrosis.

Mortality after hip fracture—the results of operation within 12 hours after admission

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In the literature a decrease of the mortality rate is reported in patients with hip fracture undergoing surgery within 24 hours of admission. We present a retrospective study undertaken to evaluate the mortality of patients undergoing hip fracture surgery within 12 hours of admission, compared with surgery following 12 hours of admission. Patients with an operative delay due to medical conditions were excluded.

778 patients were studied, the mortality rate was 10% after one month and 30% after one year. Out of 442 femoral neck fractures, 274 underwent surgery within 12 hours of admission and 168 following 12 hours of admission. The two groups were comparable concerning sex, age anaesthesia, duration of operation, occurrence of diabetes mellitus, malnutrition and anaemia.

The patients that underwent surgery within 12 hours of admission revealed a mortality rate at one year of 26% compared to 35% among patients operated following 12 hours.

The difference in mortality rate was significant ($p < 0.05$). Time of surgery did not significantly influence the mortality of patients with trochanteric fracture.

We concluded that femoral neck fracture in an otherwise fit elderly patient should be regarded as a surgical emergency.

Ankle and foot

Arthroscopic treatment of impingement in the talo-crural joint

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The aim of this study was to analyze the results of arthroscopic treatment of impingement in the talo-crural joint.

Technique: The arthroscopic surgery was carried out in general anaesthesia and with an inflated tourniquet placed over the thigh. A 3-mm 30° oblique arthroscope and a 3.5-mm safe-edge shaver were used. An anteromedial portal just medial to the anterior tibial tendon at the joint line and an anterolateral portal just lateral to the tendon of peroneus tertius were used.

Patients: Arthroscopy was performed in 14 patients from January 1989 to October 1990. 13 patients had a previous distortion and one a malleolar fracture. All patients had local swelling and tenderness anterolaterally in the talo-crural joint and pain at dorsal flexion. All of the patients had been treated unsuccessfully with NSAID, steroid injection and immobilisation in median 2 (0.6–3) years.

Results: Anterior synovitis with hypertrophic bulging synovium and fibrous meniscoid tissue was found in all 14 cases. The proliferative tissue could be seen impinging in the talofibular and tibiofibular joints. One patient with previous fracture had arthrosis. Shaver was used to resect the hypertrophic tissue in all cases. At follow-up median 8 (4–16) months later, nine patients were without symptoms, four had less symptoms and one patient with previous fracture had unchanged symptoms.

We have found the method to be suitable in selected cases of chronic pain in the talo-crural joint.

Correction of hallux valgus a.m. McBride

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Introduction: The purpose of the study was to evaluate the efficacy of a modified McBride operation in the treatment of hallux valgus. The operation is used in younger patients without any signs of arthrosis or rigidus at the first metatarsophalangeal joint.

Patient: During a period of ten years, 41 feet (38 patients) were operated on. 31 operations (29 patients) were reexamined, on average 4.5 (1–10) years postoperatively. Average age was 49 (17–76) years. There were four men in the study.

Methods: A clinical reexamination was carried out, using a standardized scheme for evaluation of pain, function and cosmetic result. Preoperative radiographs were not available for measuring the angle of hallux valgus and metatarsus primus varus, therefore the length of the foot, the width of the forefoot and the angle of hallux valgus was measured clinically and compared with the opposite foot.

Results: Preoperatively 28 patients had moderate to severe pain. Postoperatively 22 patients were totally relieved of pain, six patients had slight pain. Two patients had no relief of pain and one patient experienced an increase in pain. 20 patients had an acceptable cosmetic correction of the hallux valgus deformity. There was only one patient with stiffness of the metatarsophalangeal joint and 24 had extension/flexion range of 30° or more. The only complication was one case of superficial wound infection, and it did not have any effect on the final outcome of the operation.

Conclusion: The modified McBride procedure gives an excellent pain relief and good cosmetic results with only few complications.

Knee

Arthroscopy of the knee in children and adolescents

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A retrospective review was done of 69 children and adolescents (age 7–17) who underwent 75 consecutive arthroscopies of the knee joint during a five year period. Girls were over-represented (71%).

Results: 46 (61%) had a history of a knee injury. Twisting was the most common mechanism of injury (33/46). Most injuries happened during sports activity (34/46), of which soccer was the activity responsible for injury in half of the cases. In total 22 meniscal tears were found. Medial and lateral tears were equally common. Half of the meniscal tears were associated with other intraarticular injury. Of 17 anterior cruciate ligament injuries, 11 were combined. As seen in other studies, only half of the prearthroscopic diagnoses were confirmed at arthroscopy. Arthroscopic surgery was performed in 39 knees. Only one arthrotomy was needed.

Conclusion: Girls participating in sports are especially prone to knee injuries. Meniscal tears are relatively common findings in children and adolescents. A high frequency of incorrect prearthroscopic diagnoses and of combined lesions justify arthroscopy as an important diagnostic tool in children and adolescents with a history of knee injury or with chronic non-specific knee problems.

Acute arthroscopy in traumatic hemarthrosis of the knee

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Traumatic haemarthrosis of the knee often signifies severe intraarticular lesion.

In our department arthroscopy of patients with knee haemarthrosis is performed in the acute stage (< 1 week) if possible and in this paper we present the results from 1990.

In total, 44 arthroscopies due to traumatic haemarthrosis were performed in 1990. The arthroscopies were done in general or regional anaesthesia, a preoperative stability test was included.

Of 44 patients, 32 were men and 12 women, mean age 23 (12–55) years. 33 of the traumas occurred during sport, mainly football and handball.

Two thirds of the arthroscopies revealed ligamental tears, in two thirds of these cases combined with other intraarticular lesions.

In one fourth of the arthroscopies partial meniscal resections were done.

We conclude that in traumatic haemarthrosis of the knee severe ligamental tears must be suspected and arthroscopy should be performed in the acute stage.

Arthroscopic repair of ruptured menisci

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Introduction: The menisci are important in distribution of load across the knee joint. In the menisctomized knee the increased stress at the central parts of the joint gives rise to a high frequency of secondary arthrosis.

Patients: 34 patients underwent arthroscopic meniscal repair. 17 had an isolated lesion of the medial menisci, three had isolated lesion of the lateral menisci and 13 patients had rupture of the anterior cruciate ligament (ACL) and lesion of one of the menisci. At the time of repair of the menisci, five had their ACL reconstructed and eight had their ACL rupture treated conservatively. At the time of follow-up, six had a rerupture, these were considered as failures and were not reexamined. 28 patients remained for follow-up. Nine patients did not respond, leaving 19 patients for clinical reexamination. Tegners activity score and the Lysholm knee score were used in evaluating the patients. The average follow-up was 4 (0.5–5) years.

Results: Four of the six reruptures were in patients with a conservatively treated ACL rupture, and two were in patients with an isolated lesion of the menisci. The average Lysholm knee score before the trauma was 98 (75–100) and at follow-up it was 87 (29–100). Two patients with a major disability because of a later intervertebral slipped disc had Lysholm knee scores of 29 and 52. The average Tegner activity score before the trauma was 6 (3–9) and at follow-up it was 5 (3–9).

Conclusion: When there is no rerupture of the sutured menisci the clinical results are excellent after arthroscopic repair of the menisci. In the unstable knee the risk of rerupture in fivefold increased as compared to the stable knee.

An experimental analysis of partial ACL lesions and ligamentous and capsular restraints in the lateral knee compartment in relation to anterolateral knee instability

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Aim and methods: Anterolateral knee instability (1) was evaluated in an experimental setting using 12 normal osteoligamentous knee preparations. Abduction-adduction, coupled tibial translatory movement and coupled tibial axial rotation were recorded continuously and simultaneously during flexion or extension while applying a well defined valgus directed movement.

Results: Both during flexion and extension a small abduction and a small coupled anterior tibial translation were found after cutting the AMP but not after cutting the PLP. During extension a small coupled internal rotation was observed after transection of AMP, but during flexion no significant coupled internal rotation was found until after complete transection of the ACL. In the ACL deficient knee a small abduction, internal rotation and anterior translation were found both during flexion or extension, somewhat larger after cutting the anterolateral capsula as compared to cutting the posterolateral capsula and the popliteus tendon, but only after cutting both the ALC and PLC including the PT a consistent significant increase was found in abduction, internal rotation and anterior translation both during flexion or extension.

Conclusion: The study demonstrated the importance of realizing partial ACL lesions (primary constraints) and capsular lesions in the lateral compartment (secondary constraints) when evaluating patients with ACL ruptures/reconstructions, as these lesions will add to the interindividual variability of anterolateral knee instability and thus influence the grading of the instability.

Reference: 1) Østgaard S E, Helmig P, Nielsen S and Hvid I. Anterolateral instability in the anterior cruciate ligament deficient knee. *Acta Orthoped Scand* 1991; 62(1): 4-8

The value of preoperative radiography before elective arthroscopy of knees

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The purpose of this paper was to evaluate the routine preoperative radiography before elective arthroscopy of knees. In 1990, 385 knee arthroscopies were performed. The radiographic and arthroscopic findings were registered consecutively on a special form. Excluded were 42 patients with haemarthrosis. These patients ought to have a radiograph taken to exclude fractures etc. Also excluded were 16 patients without preoperative radiographic examination. The remaining 327 arthroscopies, performed on 325 patients were all primary arthroscopic examination. The radiographic diagnosis arthrosis was found in 36 patients. At arthroscopy signs of arthrosis were only found in 25 patients. In eight cases of arthroscopically detected osteochondritis dissecans, only two were found at the radiographic examination, and in six cases of arthroscopically detected free bodies, only one was seen at the radiographic examination.

As a consequence, we find that routine preoperative radiographic examination before elective arthroscopy of knees, gives little information about the intraarticular conditions and has a very limited diagnostic value. Thus it can be omitted.

If arthroscopy does not give an explanation of the patient's knee problems, radiographic examination ought to be considered.

Biological repair of osteochondral defects with carbon rods

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Osteochondral defects, especially osteochondritis dissecans of the knee, lead to arthrosis in a high percentage, approximately 75%, after 20 years. Treatment with partial chondrectomy and subchondral drilling, periosteal or perichondral transplantation has been disappointing. A new method with carbon fibre rods (Gateshead rods) for convex surfaces has shown promising results.

Methods: Partial chondrectomy, drilling of holes 3.2 mm in diameter to a depth of 12.5 mm in the subchondral bone. Braided carbon fibre rods were introduced in the holes. The spacing between rods was 1 cm. Postoperative immediate exercises and mobilisation with full weightbearing. Gillespie's (1979) score was used for evaluation. Control arthroscopy was performed after six and 12 months (nine patients).

Patients: 11 patients, seven males and four females, age 15–59 years.

Localization: Medial femoral condyle: nine, lateral femoral condyle: one, dome of talus: one.

Observation time: 13–28 months.

Number of rods implanted: 3–7.

Results: Preop: 19 fair, one poor. 1 year postop: seven excellent, two good, two fair. At arthroscopy: Defect totally filled up: six, 75%: one, 50%: one, < 50%: one. In seven of nine the fibrous tissue had the same density as the surrounding articular cartilage.

Conclusion: The results seem very promising, but the late outcome must be awaited.

Cemented total condylar knee arthroplasty in gonarthrosis—a 10–year follow-up

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Aim: To report long-term results of the Insall-Burstein total condylar knee prosthesis (TCP) in the treatment of gonarthrosis.

Materials and methods: We operated 113 consecutive patients (137 TCP). 28 patients (31 TCP) died in the observation period and 13 (14 TCP) were lost to follow-up. 72 patients (92 TCP) were available for a 10-year follow-up. There were 14 males (16 knees) and 58 females (76 knees). The average age was 68 (51-80) years, and the average observation time was 10 (9-11) years. All patients were examined clinically and radiographically preoperatively, two to three months postoperatively, and after one, five and ten years. All radiographs were analyzed for tibio-femoral alignment, tilt of the tibial and femoral components and radiolucency zones (RZ) at the bone/cement interface. The HSS knee-rating scale was used in the evaluation.

Results: 86% scored "excellent" or "good", eight percent were "fair" and six percent were "poor", of which two percent cover two arthrodeses due to late deep infection. These two were allocated zero points in the HSS score, and withdrawn from further evaluation. A total of 88% had "none" or "mild" residual functional pain. A range of motion above 95° (the functional acceptable limit) was found in 71%. 75% of the patients had a longer walking distance. Significant RZ were found around 27 TCP (30%), of which five patients had "moderate" functional pain. Complications were noted in eight percent, but none were fatal (two cases of pulmonary embolism, two cases of late deep infection, one case of supracondylar femoral fracture, one case of patellar osteonecrosis and one case of reflex dystrophy).

Conclusion: The long-term results of TCP are satisfactory. The prosthesis provides a high percent of pain relief, improved range of motion and walking distance. The crude prosthesis survival after ten years was 97%.

Cemented total condylar knee arthroplasty in rheumatoid arthritis—a 10-year follow-up

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Aim: To report long-term results of the Insall-Burstein total condylar knee prosthesis (TCP) in the treatment of rheumatoid arthritis.

Materials and methods: We operated 95 consecutive patients (140 TCP). 36 patients (50 TCP) died in the observation period and 13 (18 TCP) were lost to follow-up. 46 patients (72 TCP) were available for a 10-year follow-up. The average age was 68 (51-80) years, and the average observation time was 10 (9-11) years. All patients were examined clinically and radiographically preoperatively, two to three months postoperatively, and after one, five and ten years. All radiographs were analyzed for tibio-femoral alignment, tilt of the tibial and femoral components and radiolucency zones (RZ) at the bone/cement interface. The HSS knee-rating scale was used in the evaluation.

Results: 76% scored "excellent" or "good", 11% were "fair" and 13% were "poor", of which seven percent cover five arthrodeses due to late deep infection and three percent cover two revisions due to symptomatic mechanical loosening. These seven knees were allocated zero points in the HSS score, and withdrawn from further evaluation. A total of 95% had "none" or "mild" residual functional pain. A range of motion above 95° (the functional acceptable limit) was found in 54%. The average gain of motion was 16° (80–96). 65% of the patients had a longer walking distance. Significant RZ were found around 11 TCP (17%), of which two patients had "moderate" functional pain. Complications were noted in 11%, but none were fatal (five cases of late deep infection, two cases of supracondylar femoral fracture and one case of patellar osteonecrosis).

Conclusion: The long-term results of TCP are satisfactory. The prosthesis provides a high percent of pain relief, improved range of motion and walking distance. The crude prosthesis survival after ten years was 88%.

Results of non-cemented Kinemax knee-arthroplasty—a 1–2-year follow-up

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Introduction: The Kinemax prosthesis was introduced in our department in 1988 to evaluate the press-fit concept. Due to the high frequency of symptomatic mechanical loosening (21%) and residual pain (41%), we find it important to publish the preliminary results.

Materials and methods: 51 patients (51 prostheses) were operated during the period November 1988 through January 1990. One patient died in the observation period due to other reason. One patient was lost to follow-up. The average age was 67 (41–81) years, and the average observation time was 17 (10–27) months. All the patients were subjected to clinical and radiographical examination preoperatively, postoperatively, and at 3-month intervals. All radiographs were analyzed for accuracy of prosthesis implantation and radiolucency zones around the tibial component. The HSS knee-rating scale was used in the evaluation.

Results: At the latest examination, 55% scored "excellent", 23% were "good" and two percent were "fair".

Revision was performed in ten cases (21%). These represent the "poor" group. 26% of the patients with the prosthesis in situ had "mild" or "moderate" residual pain. The revised tibial components were primarily placed correctly, i.e., average tilt of 1.5° medially and 11° posteriorly. All the other prostheses were also correctly placed. Radiolucency zones around the tibial components in situ: 90% had zones ≥ 1 mm and 18% had 3-mm zones around the stem of the component. There was no correlation between radiolucency zones and residual pain.

Conclusion: The frequency of symptomatic mechanical loosening and residual pain was unacceptably high. Thus the press-fit concept proved unsuccessful, and the prosthesis is not recommended for non-cemented use.

Shoulder

Two K-wires vs one Rush-pin in Colles' fracture, Older type IV—a consecutive study

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Patients and methods: From January 1985 through June 1990, a total of 114 patients with a Colles' fracture – Older type IV were treated at the County Hospital of Aarhus, Denmark. 86 (79%) patients (42 patients with K-wires and 44 patients with a Rush pin) participated in the follow-up. At follow-up five patients were dead and 23 patients did not want to participate in the investigation. All patients were examined clinically and radiographically and the final functional outcome was scored according to the Lucas' modification of the Sarmiento demerit point-rating system.

Results: The ulnoradial mobility in the wrist was significantly better in the group operated on with K-wires, but the flexion-extension and pronation-supination were without significant difference in the two groups.

The mobility of the non-operated wrist was better than that of the operated wrist. The two treatment groups were comparable regarding sex-ratio, age, distribution of fractured dominant/non-dominant site, radial shortening, dorsal angulation and reversible sympathetic dystrophy. One patient developed caput ulna syndrome and another patient could not resume work because of reduced pronation-supination movement, both treated with a Rush pin.

Conclusion: This study demonstrated no advantage in using percutaneous fixation with two K-wires to immobilize Colles' fracture – Older type IV over intramedullary fixation with one Rush pin.

Instability of the shoulder joint following puncture of the capsule

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Introduction: Several papers have focused on the negative intraarticular pressure as a major factor concerning shoulder stability (1). The object of the present study was to evaluate the mobility patterns of the glenohumeral joint following puncture of the joint capsule.

Materials and methods: The experiments were carried out on osteoligamentous shoulder autopsy specimens. The specimens were mounted in a kinesiologic testing device. The testing device simultaneously and continuously measures anterior-posterior translation, vertical movement of the humeral head, rotation and flexion as a function of the abduction movement. Furthermore, a well-defined force or torque can be applied to the humerus during abduction movement.

During the experimental sequence the abduction was initially carried out at intact ligaments and capsule: 1) Abduction at 0° to the frontal plane. 2) Abduction at 30° to the frontal plane. 3) Abduction at 0° to the frontal plane with the humerus submitted to an external rotational torque of 1.5 Nm. 4) Abduction at 30° to the frontal plane with the humerus submitted to an external rotational torque of 1.5 Nm. 5) Abduction at 0° to the frontal plane with the humerus submitted to a translatory force of 10 N.

The joint capsule was then punctured with a syringe and the experimental sequence 1–5 was repeated. The data was analyzed using a paired t-test.

Results: Significant distal instability from 0-80° of abduction was recorded at 0° as well as 30° to the frontal plane following puncture of the capsule. Maximum of distal instability was 23.9 mm at 20° of abduction. Puncture increased the external rotation significantly with maximum 10 degrees at 30° of abduction. There was no increase in anterior-posterior translation in the whole range of abduction movement. Maximum increment was 6.8 mm at 10 degrees of abduction.

Discussion: The results obtained in the present study are in accordance with Browne et al (1). However, in this experiment we continuously measured movement patterns during abduction. Furthermore, we found a significant increment in the external rotation following puncture of the joint.

Reference: 1) Browne A O et al. The influence of atmospheric pressure on shoulder stability. Proceedings of the 7th meeting of the European Society of Biomechanics, 1990.

Experimental detachment of the glenoid labrum

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Introduction: The instability pattern of the shoulder induced by experimental lesion of glenoid labrum (GL) has only sparsely been evaluated. The object of this study was to investigate the mobility pattern of the glenohumeral joint following detachment of the anterior/inferior GL in a 3-dimensional model.

Materials and methods: 11 macroscopically normal, unembalmed human shoulders from ten males and one female, median age 41 (23–73) years, were studied after dissection, leaving capsule and the rotator cuff intact. Anterior/posterior translation, external rotation and distal migration were recorded continuously and simultaneously in a kinematic testing device from 0° to 80° of abduction at 0° and 30° to the scapular plane. The humerus was left either free to rotate or submitted to an external torque of 1.5 Nm or a translatory force of 10 N.

The testing was performed sequentially with (1) intact specimen, (2) following an anterior horizontal capsulotomia, (3) suture-repair twice, and finally (4) after an anatomical well-defined anterior/inferior GL-detachment.

Statistics: Paired t-test.

Results: The experimental anterior/inferior GL-lesion resulted in a spontaneous increased distal migration and decreased external rotation from 0° to 80° of abduction. Maximum was 2.1 mm at 60° of abduction.

An increment in forced external rotation in the range 30° to 80° of abduction was observed. Maximum was 5.4° at 50° of abduction. Increased distal migration was observed both at 0° and 30° to the scapular plane.

Anterior translation increased to a maximum of 4.3 mm at 0° of abduction to the scapular plane. Increased posterior translation was not seen.

The identical suture 1 and 2 did not change the mobility pattern of the glenohumeral joint.

Conclusion: Experimental anterior/inferior GL-lesion resulted in increased external rotation, anterior translation and distal migration in abduction from 0° to 80° suggesting the importance of GL-lesion as a component of multidirectional shoulder instability. This experimental model is able to describe complex glenohumeral instability following experimental lesion of the glenoid labrum.

Mechanical properties of shoulder ligaments

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Introduction: The purpose of this study was to describe the mechanical properties of shoulder ligaments in vitro.

Material and methods: A total of 32 bone-ligament-bone preparations of the coracohumeral ligament (CHL), superior glenohumeral ligament (SGHL), inferior glenohumeral ligament (IGHL) and the posterior capsule (PC) were obtained. Initial length and cross-sectional areas were measured and the tensile tests were performed in an Instron Universal Testing Machine at constant strain rate (0.4%/s). We studied hysteresis, stress-relaxation and load-elongation behaviour.

Results: Hysteresis was found to be 39% for all specimens and the relaxation constant was −10%/s. Maximum load: IGHL 323 (275–424) N, PC 228 (136–269) N, CHL 220 (132–267) N, and SGHL 119 (71–161) N. Highest stiffness was demonstrated in IGHL, 2.5 x 10^4 n/m, whereas SGHL showed the lowest values, 1.0 x 10^4 N/m. Values for CHL and PC 1.8 x 10^4 N/m. SGHL showed highest ultimate stress (13.7 MPa) followed by CHL (9.8 MPa). Ultimate strain varied from 22% (SGHL) to 44% (IGHL). SGHL and CHL demonstrated high elastic modulus (62.8 MPa and 42.6 MPa). Energy absorbed to maximum load represented by the area under the load-elongation curve were 2.1 J (IGHL), 1.0 J (PC), 0.9 J (CHL), and 0.5 J (SGHL).

Conclusion: All specimen showed characteristic viscoelastic properties. Highest maximum load, amount of absorbed energy, ultimate strain and stiffness was demonstrated by IGHL. SGHL and CHL had the highest stress and elastic modulus. PC showed intermediate values indicating its importance regarding shoulder stability.

Glenoid bone density. A comparison between magnetic resonance imaging and computed tomography

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Aim: The aim of the present study was to measure the density of the glenoid trabecular bone. A secondary aim was to see if bone morphological parameters could be derived from magnetic resonance imaging (MRI).

Introduction: The importance of reliable bone mass measurements is stressed by the increased use of total joint replacements and the problems connected with mechanical loosening of implants. Non-invasive evaluation of bone properties is the ideal. Among the diagnostic procedures currently available is computed tomography (CT) for determination of bone mineral content and the correlation between CT and apparent density is generally good. Recent advances in MRI on the study of bone marrow revealed that the presence of trabecular bone enhances relaxation times. Enhanced relaxation is seen when local magnetic inhomogeneity increases and when molecular motion decreases. Both effects are created in a two-phase porous structure such

as bone. The local field inhomogeneity increases due to the different susceptibility between the solid and the liquid phase and bone interaction with nearby molecules will slow their rotational and translational motion. The use of MRI for inverse determination of the volume fraction of glenoid trabecular bone therefore seems to be possible.

Methods: 12 complete human shoulders with intact soft tissues were obtained at forensic autopsies. Donor age ranged from 27 to 88 years. Immediately after MRI of the intact shoulders all soft tissues were removed and CT was performed. Following CT the glenoid was machined into 3 mm thick slices cut parallel to the scapular plane. The volume fraction of the marrow cavity and trabecular bone was measured by quantitative microscopy. The coracoid process was used for marrow analysis. MR and CT images were analyzed according to a fixed reference system and correlation parameters were calculated.

Results and conclusions: The density of the glenoid trabecular bone is low except for a thin rim beneath the joint surface. An increase in density was measured towards the lateral border of the glenoid close to base of scapular spine. The correlation between volume fraction and MRI values was good ($r = 0.89$) and MRI seems to be suitable for low density bone mass measurements such as the glenoid. MRI values are, however, related exponentially to the marrow content, which therefore becomes critical.

Spine

Posterior spondylodesis with plates and pedicle screws

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39 patients were operated with posterior spondylodesis with plates and pedicle screws. 15 patients, average age 39 years, had spondylolisthesis with spondylodesis. Six patients had secondary spondylolisthesis, median age 68 years, and 18 patients with degenerative disc/joint disease, mean age 48 years.

Four patients were operated with Roy-Camille reduction plates, the rest with Louis plates. Minimum follow-up was one year.

Result: 27 patients improved after surgery and there was solid fusion in as many cases. Two cases of infection, and six cases of transient radicular pain were encountered.

Selection of fusion levels in idiopathic adolescent scoliosis

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Introduction: The selection of fusion levels is still a topic of debate. King has advocated that in Type 2 scoliosis, selective fusion of the thoracic curve could be made to the stable vertebrae, and Cochran and Nachemson (1983) have shown high incidence of low back pain in patients fused to L4 or L5. The policy in our department is to fuse one level above and two levels below the thoracic curvature, and to avoid fusions below L3. The purpose of the present study was to evaluate the results according to this strategy, and especially to analyze our results when fusion level differed from King's criteria.

Patients and methods: We reviewed the clinical charts and radiographs of 111 patients operated with Harrington-Cotrel instrumentation for idiopathic scoliosis. The data was reviewed to analyze how the difference between the lower level of fusion and the stable vertebrae, influenced on the correction of the thoracic and the lumbar curves as well as the truncal and the shoulder decompensation.

Results: In Type 2 and Type 3 scoliosis, there was a trend towards better results if the fusion included the stable vertebrae. In 11 patients with Type 4 scoliosis, all were fused 2 or 3 vertebrae short of the stable vertebrae, in contrast to the recommendations by King, and all had satisfactory results. In Type 5 scoliosis our results were comparable to King et al, despite the fact that the fusion was two or three vertebrae short of the stable vertebrae. None of these trends are significant.

Conclusion: We conclude that the lower level of fusion in Type 2, 3, 4 and 5 should be the stable vertebrae, but not exceed L3. This conclusion is based on the radiographic results, and is further supported by the lower incidence of low back pain if fusions to L4/L5 is avoided.

Early results after surgical treatment of lumbosacral spondylolisthesis

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The optimal surgical treatment of patients with spondylolisthesis is still under debate. Hence we have found it of importance to present our early results with a newly introduced surgical method.

Material and methods: 14 patients with lumbosacral spondylolisthesis were operated a m Roy-Camille. None of the patients had been surgically treated before. The average observation time was 7 (1–31) months. The anterior dis-

placement of L5 on S1 was measured on pre- and postoperative roentgenograms. A laminectomy and facetectomy was performed to decompress the L5 and S1 nerve roots. The plates were first fixed to the sacrum, and after that pedicular screws in L4 and L5 exerted the reduction. Finally posterolateral fusion was performed. Postoperatively all patients wore a total contact brace for three months.

Results: Two patients had temporary affection of the fifth lumbar root with no residual symptoms after three months. There were no cases of wound infection. Two cases of material disruption occurred; one fractured plate and one loosening of a pedicular screw. In none of the cases secondary displacement occurred. Preoperatively the average displacement was 37 (13–67) % and postoperatively 24 (7–51) %. Preoperatively nine patients were on permanent sick leave. Postoperatively seven were back to work. The patients were back to work 5 (3–7) months postoperatively.

Conclusion: The short-term results after posterior surgical treatment of spondylolisthesis with the described technique seem promising, and the risk for surgical complications, especially neurological, is low compared with other techniques.

Transpedicular bone grafting in unstable thoracolumbar spinal fractures

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The application of segmental fixation for the treatment of unstable thoracolumbar spinal fractures provides a tool for early decompression of the spinal canal and correction and stabilisation of spinal deformity. In order to optimize restoration and preservation of anterior vertebral height we performed transpedicular reduction of compressed endplates followed by cancellous bone grafting in eight out of 26 patients treated with the AO Internal Spinal Fixation System of Cotrel-Debousset Instrumentation median 5 (1–20) days after trauma. The procedure was attempted in two further patients. No patients had major neurological lesion.

The vertebral fracture was initially reduced by extension and distraction via the fixation device. The most intact pedicle of the fracture vertebrae was then opened with a pedicle probe and a 6 mm manual drill. A curved punch was brought into the vertebral body to lift the endplates. Bone paste taken from the iliac wing with an acetabular reamer was then packed into the vertebrae. This procedure was completed in eight patients, but given up in two patients due to detection of a defect in the medial pedicular wall following drilling. A preoperative myelogram confirmed reduction of posterior wall fragments and unobstructed flow of contrast dye in all patients.

Conclusion: Transpedicular reduction and bone grafting are promising techniques, which may improve restoration and conservation of vertebral height and thus decrease the residual kyphosis of fractured spines.

Risk factors for nonunion in anterior intercorporal spondylodesis

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The purpose of this study was to identify risk factors for nonunion of intercorporal spondylodesis at L4–L5, and L5–S1 level in a sample of 100 randomly selected patients operated in the period of 1979 to 1987. Minimum follow-up was one year. Median age for patients with spondylolisthesis was 28 (15–55) years and for disc degeneration 43 (24–54) years, $p < 0.0001$. Graft incorporation was present in 50% of the patients, whereas it was doubtful in 25% and absent in 25%. The 25 patients with doubtful healing were discharged from the analysis. Using Fisher's exact test and non-parametric two sample test no influence of sex, diagnosis, degree of spondylolisthesis slip, posterior facet screw fixation or postoperative bracing on union could be demonstrated. However, previous spine surgery, age above 30 years and fusion at both levels was followed by lower healing rates. The last group might be candidates for newer fusion techniques.

Tumors

Aneurysmal bone cyst

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Purpose: To illustrate treatment of and prognosis for aneurysmal bone cysts.

Patients: 26 cases of aneurysmal bone cyst were diagnosed and treated from 1973 to 1991. 18 of the patients were male and eight were female. Six of the patients had an accompanying benign lesion of bone in which the aneurysmal bone cyst was secondary, while 20 patients had a primary cyst lesion. The mean age was 15 years for patients with primary cyst and 28 years for patients with secondary cyst. The majority occurred in long tubular bones. The time of observation varied from four months to 11 years, on average four years.

Treatment: The preferred treatment consisted of curettage and bone grafting. Resection was used in a few cases, where it could be done without interference of function.

Results: 18 cysts healed without complications. In six cases the cyst recurred, none had a second relapse. All six cases of relapse occurred within two years. Of all patients treated, three had a slightly affected function at the final examination, the others were completely normal.

Discussion: In the treatment of aneurysmal bone cysts, it is extremely important to recognize whether the lesion is primary or secondary, as the cyst can be secondary to malignant tumors. In these cases it can be very difficult to achieve an adequate biopsy to establish the correct diagnosis. Because of the great risk of relapse after the treatment of aneurysmal bone cysts with curettage and bone grafting, regular follow-up examinations are necessary the first years after treatment.

Miscellaneous

The effect of vitamin D on the metabolism of human bone cells measured with mass spectrometry

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The role of vitamin D3 in bone remodelling is well established. Previously the effect of vitamin D3 on the metabolism of bone cells has been examined with indirect techniques. Furthermore, long periods of incubation have been necessary. We have introduced a technique for in vitro measurement of the metabolism of human bone cells based on mass spectrometry. With this technique it has been possible to examine the immediate metabolic effect of vitamin D3 on cultured human bone cells.

Bone cells were cultured from trabecular bone obtained from patients undergoing surgical procedures for arthrosis. After five weeks of incubation the cells were used for experiments. The oxygen consumption was measured with a mass spectrometer connected to a specially designed measuring chamber. The basic oxygen consumption was registered for 30 minutes. After this vitamin D3 was added to the cell chamber and oxygen consumption was measured for an additional 30 minutes.

Concentration of vitamin D3	O_2 consumption x 10^{-9} L/min	
	Before vitamin D3	After vitamin D3
1. 0.21 x 10^{-8} M (n 3)	0.2	0.6
2. 0.42 x 10^{-8} M (n 1)	0.2	0.5
3. 0.63 x 10^{-8} M (n 1)	0.1	0.5

These results show that mass spectrometry is a feasible method for the investigation of the direct, immediate effect of vitamin D3 on the metabolism of human bone cells in vitro. The method can provide valuable information about the effect of other substances on the metabolism of bone cells.

The effect on cortical bone of reaming and filling of canine tibial diaphysis with inert bone wax

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Reaming the marrow cavity of tubular bones removes the blood supply to the inner two thirds of cortex. If, in addition, the marrow cavity is filled with cement, blood supply from endosteum cannot be restored. The present study was undertaken to elucidate the effect of reaming and filling of diaphyseal bone.

Methods: In four dogs one tibia was reamed while the contralateral tibia remained untouched. Two dogs were followed for four weeks and two for 12 weeks. Six dogs had one tibia reamed and filled with inert bone wax while the contralateral tibia was only reamed. These dogs were followed for four weeks. Blood perfusion was measured by microsphere technique and visualized by vital staining with Disulphine Blue. Bone metabolism was estimated by ^{99m}Tc-MDP uptake in bone. Bone remodelling was measured on histological sections.

Results: Blood perfusion in all cases was highest on the reamed side in the first series and on the wax filled side in the second series ($p = 0.03$). ^{99m}Tc-MDP uptake was largest on the wax filled side in 5/6 cases. The histological sections revealed most remodelling centrally in cortex in the reamed bones and in the perifery of cortex in the wax filled bones ($p = 0.03$).

Conclusion: Blocking of the marrow cavity severely changes the processes of revascularisation and remodelling, and may be as important a factor for bone remodelling as physical and chemical damage from bone cement.

Incidence of venous insufficiency following fractures of the long bones of the lower extremities

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This is a long-term survey on the incidence of subjective symptoms suggestive of venous insufficiency (VI) after fractures of the long bones of the lower extremities.

170 patients with a median age of 29 (20–50) years answered a questionnaire that focused on symptoms of VI in the legs a median of 9 (7–12) years after suffering fractures of the long bones. Symptoms were graded according to a score modified after Browse et al (1980).

At follow-up, 39 patients (23%) had developed symptoms suggestive of VI (29 had symptoms in the fractured leg, five in the sound and five bilaterally). Development of ulcers was a common complication and was registered in 72% of patients with VI. Risk factors for development of VI were surgical treatment, open fracture and long-lasting immobilization (more than seven weeks).

Conclusion: Symptoms of VI were common long-term findings after fractures of the lower extremities.

Cancelled operations in an orthopedic department

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During a four month period all cases of cancelled elective in-patient operations in a major Danish orthopedic unit were prospectively registered. Patients who had their operation cancelled less than two days before planned surgery were included in the study. 600 operations were performed (group 1), 86 (13%) were cancelled (group 2). The reasons for cancellation were: insufficient preoperative preparation of the patient 40%, acute onset of disease contraindicating surgery or failure to attend for operation 23%, and inadequate operating capacity most often due to shortage of staff (disease, educational programs etc) 36%. Age, sex or type of surgery planned did not differ significantly between group 1 and 2. Non-attendance before surgery was significantly related to low age of the patient. The surgical procedures were generally cancelled 0–1 day before time of schedule. We suggest the following recommendation:

1. a booking system taking into consideration the personal and occupational circumstances of the patient,
2. reconfirmation from the patient approximately one week before surgery,
3. early medical screening of the patient combined with anaesthetic pre-med evaluation,
4. early sampling for blood group compatibility, and
5. flexibility concerning the results of sudden shortage of staff.

It is estimated that a 50–60% reduction of the number of cancelled operations would have been possible by the adoption of these measures.

Injuries caused by angle grinders

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Purpose: An analysis of injuries caused by angle grinders with a view to their prevention.

Materials and methods: In the year of 1990, 139 job related injuries involving angle grinders were seen in the emergency room (ER).

Results: Of these injuries 87% (121) were foreign bodies in eyes and corneal abrasions, 8% (11) were cuts on the limbs, and 4% (6) were contusions.

71% (86) of the eye injuries were seen in the age group 20-39 years whereas 4% (5) were seen in persons under the age of 18. 70% (85) of the eye injuries treated in the ER needed no additional treatment, while 26% (32) were referred to opthalmologist for removal of foreign body or coagulation tissue. The remainder needed no treatment at all. There were no penetrating eye injuries.

As regards the remaining 18 injuries, half of these were cuts needing no suture and no further treatment than that of the ER. Two patients were admitted for suture of nerves and tendons. Two patients with tendon injuries were referred to the out patient clinic for follow-up, while seven patients with sutured cuts were followed by their GPs.

Conclusion: Foreign bodies and corneal abrasions constitute the majority of injuries caused by angle grinders. Correct use of safety glasses prevents these injuries and thus visits to the ER and opthalmologist.

Accidents with playground equipment among children

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The aim of this study was to determine the incidence rate and to determine the etiology and the severity of accidents caused by playground equipment during 1989.

The number of children aged below 15 years was 42 635. 270 playground accidents were registered, which resulted in an incidence rate of 6.3 per 1 000 children per year.

The male/female sex ratio for the population studied was 1.31 while the sex ratio in the background population was 1.05. The majority of accidents were seen in the spring, especially in April and May.

Swings, climbing frames, slides, playhouses and playcastles were responsible for 80% of the accidents. The etiology was fall accidents in 211 cases, being caught between two

objects in 17 cases, being caught by an object in 21 cases and different causes 21 cases.

The severity of the injury was classified by the Abbreviated Injury Scale and was found to be: no lesions 1%, minor lesions 70%, moderate lesions 25% and severe lesions 4%. A total of 17 patients were admitted to hospital and of these 13 patients had a fracture.