

Proceedings of the Danish Orthopaedic Society: Copenhagen, October 28-29, 1983

Niels J. Holm

To cite this article: Niels J. Holm (1984) Proceedings of the Danish Orthopaedic Society: Copenhagen, October 28-29, 1983, Acta Orthopaedica Scandinavica, 55:3, 390-397, DOI: [10.3109/17453678408992381](https://doi.org/10.3109/17453678408992381)

To link to this article: <https://doi.org/10.3109/17453678408992381>



Published online: 08 Jul 2009.



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Proceedings of the Danish Orthopaedic Society

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Arthroplasty of the shoulder a.m. Neer with special reference to the resection of the humeral head

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In an attempt to further standardize the operative technique, a resection guide for the humeral head was developed. The guide consists of a metal plate connected to a rod at the same inclination as the head of the prosthesis. At the other end of the rod, the indicator is placed in 35 degrees of external rotation in proportion to the metal plate. In placing the externally rotated indicator parallel to the forearm, a retroversion to the guide plate of 35 degrees is accomplished. The resection guide was tested in seven patients. The retroversion of the prosthesis was determined by a special axial X-ray of the humerus. The mean retroversion of the humeral prosthesis was measured to be 37 (42-33) degrees. The resection guide will ensure a uniform retroversion of the prosthesis.

Operative treatment of fractures of the proximal humerus

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The results after operative treatment of 40 severe proximal humeral fractures are reported. The fractures were classified according to Neer. The treatment consisted in osteosynthesis according to the AO method in 32 patients. Twenty patients were reexamined from 2 to 7 years after the operation. According to Neer's functional assessment the results were excellent or satisfactory in nine of 20 patients. Com-

pared to other reports, the patients in the series were older and the fractures more severe. The degree to which a good anatomical reduction was achieved correlated positively with the end result. The most common technical error was a too proximal positioning of the AO plate, leading to postoperative restriction in abduction movements of the glenohumeral joint.

A modified Bankart procedure for recurrent dislocation of the shoulder

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In 42 patients, operated on during a 10-year period (1972-1982), staple capsulorrhaphy as described by Dutoit was employed. Twenty patients were re-examined and 14 answered a detailed questionnaire including questions about recurrence, stability, mobility, and function. The lesions found at surgery were a Bankart lesion in 35 shoulders, a Hill-Sachs lesion in 12 shoulders, loose bodies in one, and excessive laxity of the shoulder capsule in two. All patients were operated by or were under the supervision of the same surgeon. At follow-up 1-10 years after surgery (mean 6 years), the results were rated as excellent in 29 patients, good in ten, and poor in three patients who had recurrences. We conclude that with this technique early return of motion or function may be expected in most patients. Resumption of former athletic activities with no limitation of shoulder motion is possible even for athletes on a competitive level.

The suprascapular nerve compression syndrome – a cause of shoulder dysfunction

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The Suprascapular Nerve Compression Syndrome (SNCS) is an infrequent cause of disability in the shoulder region and only sporadic reports have so far been published. SNCS is characterized by a diffuse aching pain in the shoulder with paresis of abduction and external rotation of the arm. Atrophy of the infra- and supraspinatus muscles is typical. The symptoms of SNCS and rotator-cuff lesions are nearly identical, but may easily be differentiated by the use of electromyography, which will demonstrate a suprascapular mononeuropathy if SNCS is present. Five cases of SNCS are presented and the diagnosis is outlined. All patients had excellent results from surgical decompression of the nerve at the suprascapular notch by transection of the transverse ligament.

Can metal allergy cause loosening of a cemented hip prosthesis?

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Although interest in aseptic or mechanical loosening of cemented alloplasties is mostly concentrated on technical and biomechanical causes, it has been suggested that a delayed metal hypersensitivity may be the cause of aseptic loosening.

Fifty-six patients with mechanical loosening of Charnley hip prostheses were tested for allergy against nickel, chrome and cobalt with a patch test. Eight patients proved allergic to one or two of the metals. When they were correlated to a small control group of patients without loosening, no overrepresentation of allergic conditions was found. In all cases the loosening could be explained by other causes than allergy. It has been demonstrated that patients with loose metal-to-metal prostheses have a higher allergy rate than patients in control groups. Also, patients with modern low-friction alloplasties have small concentrations of metals in tissue and blood, increasing the potential for the development of an allergy. Whether the allergy is the cause or the result of loosening, however, is still a matter of conjecture. With the tests available at the present time,

it has not been proven that an allergic reaction may cause loosening of a cemented low friction arthroplasty. The theory seems mostly speculative and it is concluded that no special immunological investigations or procedures are necessary in the treatment of aseptic loosened hips.

A double-blind study comparing the effectiveness of prophylactic antibiotics in the prevention of infectious morbidity after amputation in the lower extremity

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In a multicentre study, the efficacy of prophylactic antibiotic therapy in the prevention of infectious morbidity after amputation of the lower extremities because of arteriosclerosis was investigated in a double-blind study. One hundred and seventy-nine patients were divided into two groups. One group received Cefoxitin 2 g $\times$ 5 intravenously on the day of the operation. The other group received corresponding placebo injections. The frequency of wound infections was 34 per cent in the placebo group versus 16 per cent in the Cefoxitin group ($p = 0.0054$). The frequency of reamputation was significantly lower in the Cefoxitin group (22.9 percent versus 9.4 percent, $p < 0.025$).

Prophylactic administration of antibiotics should be used in amputation of the lower extremities.

Total shoulder arthroplasty a. m. St. Georg

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The results of total shoulder arthroplasty a.m. St. Georg in seven patients are presented. Six patients suffered from rheumatoid arthritis and one patient from the sequelae of a serious fracture dislocation of the shoulder. All the patients complained of pain at rest and had failed to obtain relief from medical treatment and physiotherapy. Active movements were grossly limited and there was radiographic evidence of severe destruction of both the humeral head and the glenoid in all patients. No postoperative complications occurred.

Complete relief of pain at rest was noted in all patients but one after an average follow-up of 30 months. The range of internal rotation was improved in all patients but one, while abduction, flexion and external rotation were unchanged at follow-up. The subjective assessment of function was improved in all patients but one. Dislocation and clinical or radiographic loosening of the components were not seen during the period of follow-up.

The present study and previous reports indicate that total shoulder arthroplasty with a non-constrained prosthesis permits better functioning of the shoulder, primarily because of relief of pain in patients with rheumatoid arthritis.

Regional blood flow and microvascular volume in arthritis of the juvenile hip

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The effect of chronic synovial inflammation and joint effusion on juxta-articular haemodynamics of the juvenile hip joint was investigated in mongrel puppies. Unilateral arthritis was induced by repeated intra-articular injections of Carrageenin into the hip joint for 12 weeks ($N=7$). Five dogs served as controls and had weekly instillations of saline into the hip joint for the same period. Regional blood flow was measured using a tracer microsphere technique and small vessel volumes were estimated from the distribution volume of Cr^{51} -labelled erythrocytes and I^{125} fibrinogen. The hip joint pressure was measured in both groups. Arthritis caused a significant elevation of intra-articular pressure and synovial hyperaemia. The blood perfusion of the epiphysis of the femoral head was not significantly changed. In both the joint capsule and the femoral epiphysis, the microvascular volume was insignificantly increased. In the control group no changes of haemodynamics were found. The results suggest that blood perfusion of the epiphysis of the femoral head is largely unaffected during prolonged synovial inflammation and moderate increase of hip joint pressure. An independent pathogenetic role of synovitis in Morbus Calvé Perthes is unlikely.

Long-term results of intertrochanteric osteotomy for osteoarthritis of the hip in patients under 60 years of age

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Intertrochanteric osteotomy in painful osteoarthritis of the hip was assessed in 81 patients under 60 years of age with 88 operated hips. The results were defined as good in cases where the hip was classified in a better pain group according to Collert's (1974) grading system and where the hip had not been converted to total hip prosthesis. The durability of pain relief was assessed using "survivorship functions" (1952).

There was an immediate good effect in 90 per cent of the cases. Deterioration occurred most frequently during the first years after operation. After 5, 10 and 15 years, 64, 53 and 45 per cent, respectively, were classified as good. A subgroup (A) ($n=50$), judged as particularly suited for intertrochanteric osteotomy, with predominant pain at rest, flexion/extension of more than 60° and excluding sequelae from fracture or rheumatoid arthritis, was compared with the remaining group (B) ($n=38$). After 5, 10 and 15 years, 81, 66 and 56 per cent in group A, respectively, were good against 36 per cent after 5 years and an unchanged 36 per cent after 10 and 15 years in group B.

Prevention of contact dermatitis caused by methylmethacrylate

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Contact eczema caused by methylmethacrylate monomer (MMM) has been described in operating theatre staff, but surgical gloves which are impervious to MMM were not previously available. By means of *in vitro* investigations, gloves made of butyl rubber were found to be impervious to MMM. The use of butyl rubber gloves with a thickness of 0.48 mm while handling MMM was demonstrated to be capable of preventing skin eruptions in an orthopaedic nurse with known contact allergy to MMM. To avoid sensitization butyl rubber gloves may be recommended to persons who are in contact with MMM. The butyl rubber gloves should be worn by persons with known contact sensitization to MMM during handling of acrylic bone cements.

Evaluation of methods for measuring grip strength

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Three instruments for the measurement of grip strength: the steel spring dynamometer, the Martin Vigorimeter, and the My-gripper, were tested in a universal testing machine to evaluate the linearity of the readings. In addition, a clinical study including 100 normal probands evaluated the applicability of these instruments.

It was concluded that the steel spring dynamometer was not suitable for clinical use, due to lack of precision. The Martin Vigorimeter and the My-Gripper were both very precise instruments. The My-Gripper seems to be preferable for clinical use because it is easy to handle and cheap. Furthermore, the instrument can accumulate the results of several trials, facilitating the calculation of average grip strength.

A "normogram" showing the relationship between the dominant and the non-dominant hand is given. This relationship was independent of age, sex, height and weight.

Microsurgical reconstructions of osteocutaneous defects of the lower leg

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The results following microsurgical reconstruction of post-traumatic combined skin- and bone defects in the lower leg by transplantation of the *free osteocutaneous iliac flap* are reported 9–46 (median 21) months postoperatively in 12 patients with either a compound fracture defect (four patients) or a pseudarthrosis of the tibia (eight patients), combined with osteitis in seven of the 12 cases. The skin defects on average measured 19×11 cm and the bone defect ranged from 7 cm to 12 cm in length.

Soft tissue healing was obtained within 1 month and clinical bone healing was evident after 6–13 (median 9) months, although a fracture of the bone graft was seen in one patient and a pseudarthrosis developed at the cranial graft-tibial junction in another patient. In five patients normal gait was regained, while seven patients needed orthopaedic footwear and two patients needed a cane for trouble-

free ambulation. Donor site morbidity was negligible. This reconstructive method seems to be a valuable supplement in the reconstructive armamentarium and a worthwhile alternative to amputation.

Sliding-nail or sliding-screw in the treatment of femoral neck fractures. A controlled clinical trial

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The series consisted of 48 patients with femoral neck fractures, including 18 patients randomly allocated to internal fixation with a sliding-nail and 30 patients with sliding screw fixation. A clinical follow-up was undertaken 2–5 years postoperatively. Avascular necrosis was encountered in 17 percent following sliding-nail fixation and 10 percent following sliding-screw, whereas the comparative figures of non-union or femoral neck resorption were 28 and 13 per cent, respectively.

Reoperations were performed in 28 per cent following sliding-nail fixation, compared to 23 per cent in the sliding-screw series. Secondary displacement of the femoral head was encountered in three patients following sliding-nail fixation ($P=0.05$), due to undesired telescoping. The frequency of secondary varus angulation was 39 per cent in the sliding-nail series, as compared to 7 per cent following sliding-screw fixation ($P=0.08$).

Although this is a small series, the conclusions are well founded statistically. The choice of treatment for femoral neck fractures is the sliding-screw rather than the sliding-nail, as more secure fixation of the femoral head is obtained, thus preventing failure of fixation. The hypothesis that the fairly large drilling of the femoral head leads to an increased risk of avascular necrosis could not be proved in the present series.

Experimental lateral instability of the ankle

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Nine legs freshly amputated above the knee were radiologically examined for anterior drawer sign and talar tilt after successive transection of the lateral ankle ligaments in three different sequences. An ap-

paratus secured the position of the ankle joint in 25° of inward rotation and 10° and 30° of plantar flexion of the ankle joint respectively.

The examination for anterior drawer sign demonstrated a significantly greater displacement with the foot in 10° than with the foot in 30° of plantar flexion, most pronounced after cutting the anterior talofibular ligament. The examination for talar tilt showed a non-significantly greater displacement at 10° of plantar flexion, except when cutting both the posterior talofibular and the anterior talofibular ligament.

Isolated cutting of the calcaneofibular ligament resulted in little displacement, irrespective of the method used.

During clinical examination for lateral ankle instability, it is advisable to employ both methods in order to disclose ruptures of the ligaments. The anterior drawer sign or talar tilt should be examined in 10° of plantar flexion, and in radiological examination should be supplemented with 25° of inward rotation of the leg.

Osteotomy of the patella in the patellofemoral pain syndrome

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In 40 patients with severe patellofemoral pain syndrome, simultaneous pressure measurements were carried out in the patella and the condyles. In the painful patellae a significantly elevated pressure was found as compared to a normal patella (29 mmHg versus 15 mmHg). Using the so-called *sustained flexion test*, a classic movie-sign could be provoked in almost every painful patella. Pain aggravation was correlated to a rise in the intrapatellar pressure which was significantly higher in the affected patella (97 mmHg vs. 60 mmHg). Fifty-one painful kneecaps were osteotomized longitudinally a.m. Morscher without any complications. In the follow-up period of 18 months, dramatic pain relief was obtained as measured by a visual analogue scale (from 73 to 17, $p < 0.001$).

Multiple joint reconstructions in rheumatoid patients

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A socio-medical follow-up study was done on 23 rheumatoid arthritis patients, who had had three or more

alloplastic joint reconstructions. The total number of implants was 80, one patient having had six, eight having had four each and 14 having had three prostheses each. There were four elbow prostheses, 32 hips, 40 knees, and four ankle prostheses.

The results were good with regard to pain, 74 per cent of the patients and 93 per cent of the joints being either free from or having only slight pain.

There was also considerable improvement in walking function. Over half of the patients had been wheelchair-bound or bedridden preoperatively. After the operations, almost 40 per cent of the patients had obtained a good walking function and none were bedridden any more.

Concerning selected activities of daily living the improvements were more modest, in many cases due to poor hand function. About half the patients had improved their ability with regard to personal hygiene, and dressing had become possible for five patients and shopping for eight.

The use of domestic help was unchanged on the average, but all the patients had been able to remain in their own homes.

Operative treatment of lateral epicondylitis

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Lateral epicondylitis of the humerus is a condition with a high percentage of spontaneous cure. The condition should primarily be treated conservatively. In cases that prove resistant to treatment (approximately 5 per cent), operative treatment is indicated. Many different operative methods exist for this condition. A retrospective investigation of 23 patients undergoing operation, (two were submitted to bilateral operations), using a modified Bosworth III procedure, revealed that 20 (80 per cent) were free from pain, three (12 per cent) were relieved but not entirely free from pain, and two (8 per cent) obtained no benefit from the operation. The Bosworth III procedure may apparently be recommended in cases that are resistant to conservative treatment.

Forearm fractures with distal-ulnar dislocation

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Of 24 forearm fractures with distal radio-ulnar dislocation, 19 were of the Galeazzi type and five had fractures of both bones. Two Galeazzi lesions were treated by closed reduction and 22 were operated on, seven with Rush pins and 15 with AO-plates; this included the cases with fractures of both bones. In all cases the arm was immobilized in a high circular cast until radiographic healing had taken place. Delayed union appeared in 8/22 of the operated cases and these were treated with bone grafts. Refractures occurred in five of 15 cases shortly after the removal of the AO-plate. At the follow-up of 22 patients (mean 48 months after treatment), 75 per cent had good or satisfactory rotation of the forearm, while 25 per cent had poor results, which in nearly all cases could be attributed to a persistent dorsal displacement of the distal end of the ulna.

Injuries caused by violence during a one-year period in the city of Aarhus

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During the period from March 1, 1981 to February 28, 1982, the Accident Analysis Center in Aarhus county conducted a prospective study of all persons requesting treatment after being subjected to an act of violence. The study was done in collaboration with Aarhus Community Hospital, Aarhus County Hospital, the Institute of Forensic Medicine and the Police. One thousand six hundred and thirty-nine persons were examined, corresponding to 3.4 per cent of all persons seeking treatment in the acute wards. Seventy-seven per cent were men. The violence took place round the clock, but was concentrated at week-ends and in the evening and during the night. There was an even distribution throughout the year. The violence mostly took place among males aged 15–30 years and it most frequently occurred around bars and discotheques. Violent acts towards women most often happened at home. Thirty-seven per cent of the casualties had contusions, 35 per cent had open wounds, and 15 per cent had fractures. Four per cent had superficial lesions, 3 per cent had distortions and the remaining 6 per cent had other kinds of lesions. Sixty-two per cent of all lesions were found in the head and face. Three per cent of the casualties had concussion, 70 per cent had been hit with a blunt instrument, and nine per cent had been injured by a sharp instrument. Thirty-three per cent needed no treatment at all. This was mostly the case with women.

Fifty-two per cent needed no further treatment,

but 3 per cent of the casualties were admitted to an orthopaedic ward, while 13 per cent were referred to another department.

There were 10 deaths, but 98 per cent of the injuries were rated as minor to moderate on the Injury Scale, which, however, was found to be inappropriate for this purpose.

The treatment of humeral shaft fractures. Hanging cast versus functional bracing, a randomised study

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A prospective, randomised trial, comprising 50 patients with fractures of the humeral shaft, was carried out over a period of 2 years. Twenty-four patients were allocated to treatment with a hanging cast (HC) and 26 to functional bracing (FB). Patients with paralysis of the radial nerve, pathological fractures and multitraumatised patients were excluded from the trial. The patients were followed as out-patients every 2 weeks until union of the fracture took place and the function of the limb had fully recovered. A further clinical and X-ray follow-up was performed 6 months after the accident. There were two non-unions in the HC group and one in the FB group. In one case the functional brace was unable to maintain an acceptable position of the fracture. These four fractures were operated on with a good result. In the rest of the patients, fracture union took place without serious complications. The time until fracture union for the HC group was significantly shorter ($P=0.047$). There was no significant difference in angulation of the humeral shaft between the two methods and no serious angulation was observed. The recovery of mobility and social function was statistically analysed and the groups were compared with a log rank test. The recovery of extension of the elbow and of supination/pronation of the forearm was significantly faster in the FB group ($P<0.014$). The recovery of shoulder movement showed no significant difference between the two groups.

The recovery of social function, classified according to a social activity scale (Patrick, D. L. et al. *J. Hlth Soc. Behav.* 14:6–23, 1973) showed a significantly faster recovery for the FB group ($P=0.026$).

Phantom limb phenomena in amputees during the first 6 months after amputation

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The incidence and clinical picture of non-painful and painful phantom limb sensations and stump pain were studied in 58 patients (mean age 69.8 years) 8 days and 6 months after amputation. The incidence of a non-painful phantom limb, phantom pain and stump pain 8 days after surgery was 84 per cent, 72 per cent and 57 per cent, respectively. Six months after amputation the corresponding figures were 90 per cent, 67 per cent and 22 per cent. Kinaesthetic sensations (a feeling of length, volume or other spatial sensations of the affected limb) were present in 85 per cent of the patients with a phantom limb, both immediately after surgery and 6 months later. However, 30 per cent noticed a clear shortening of the phantom limb during the follow-up period. Of the 67 per cent having some phantom pain at the latest interview, 50 per cent reported that the pain was decreasing. During the follow-up period, the localization of phantom pain shifted from a proximal and distal distribution to a more distal localization. While knife-like, piercing phantom pains were most common immediately after surgery, a squeezing or burning type of phantom pain was usually reported later. Possible mechanisms for the present findings in the periphery, the spinal cord or the brain were discussed.

A radiological comparative analysis of the sliding screw-plate and the McLaughlin nail-plate osteosynthesis in trochanteric fractures

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A comparative study was performed to evaluate the technical complications of the McLaughlin technique in comparison with sliding screw-plate fixation of trochanteric and subtrochanteric fractures. The series included 100 patients in each group. The fractures were followed radiologically for 3 months.

Technical problems were encountered in 13 per cent of the fractures operated with the sliding screw, whereas the figure for the patients treated with the McLaughlin method was 77 per cent. However, only

nine patients in the McLaughlin group needed re-operation. No sliding screws were re-operated. The main complication in both groups was varus dislocation. With the sliding screw, this was always combined with a lateral cutting of the screw, whereas the varus dislocation in the McLaughlin group was often combined with failure at the nail-plate junction.

It appears from this study that the sliding screw-plate has a significantly lower rate of technical complications and a significantly higher rate of healing, especially in unstable fractures.

Rotatory instability in cadaver knees after transection of the collateral ligaments and the capsule

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The significance of the medial and lateral collateral ligaments of the knee in relation to valgus-varus and axial rotational instability was investigated on 20 osteo-ligamentous preparations.

Anteromedial instability resulted from cutting the medial collateral ligament and was considerably increased by further cutting of the posterior medial capsule. In the semiflexed position, this also resulted in a pronounced posteromedial instability.

Cutting of the lateral collateral ligament caused only slight varus instability. Further transsection of the posterior lateral capsule increased this instability considerably. Anterolateral instability was only slightly affected, while a marked increase in posterolateral instability was noted in the semiflexed position.

An evaluation of the influence of bone cement components, non-steroid anti-inflammatory drugs and steroids on bone metabolism

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In order to evaluate changes in bone turnover, an *in vitro* system using calvaria was demonstrated. The turnover of radioactive calcium, proline release and the alkaline and acid phosphatase activity were measured histochemically and biochemically. Bone cement monomer gave a significant, dose-dependent depression of all parameters studied down to values

equal to dead bone. The turnover of bone was found to be reduced with concentrations of monomer that were lower than those found in polymerized bone cement. Gentamicin showed a dose-dependent depression of release of radioactive calcium, but this was not significant in therapeutic concentrations of Gentamicin. The combination of 80 µg/ml Gentamicin and varying amounts of monomer did not differ significantly from the results found with monomer alone, although there was a tendency to a slightly increased depression. Naproxen in therapeutic concentrations gave a slight depression of calcium release. Both Prednisolone and Deflazacort®, a new Glucocorticoid, showed a dose-dependent depression of the release of both radioactive calcium and proline, but the depression found with Deflazacort was significantly smaller, supporting the concept of a calcium-sparing effect of Deflazacort. Naproxen, Prednisolone and Deflazacort all showed a decreased depressive effect in high concentrations.

A method for determining the number of receptors in the calvaries has been developed and may help to explain the decreasing effect.

Peroperative measurement of cancellous bone strength at the knee

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An instrument (osteopenetrometer mk II) was developed with the purpose of measuring cancellous bone strength at the knee during total knee replacement. The principle of measurement is one of simultaneously recording the depth and the force of penetration of a relatively thin needle, which is advanced into the trabecular structure in the direction of the long axis of the bone at constant velocity. Measurements are picked up indirectly through a hydraulic system in order to avoid exposure of electronic parts to sterilization procedures. The force transducer measures the sum of resistance to penetration and the resistance in the hydraulic system. Correction of the force coordinate is obtained by sub-

traction of reference values from a measuring cycle with no external force applied to the needle. The procedure is computerized and the results are immediately available.

Osteopenetrometer measurements were compared to the results of conventional compression tests on machined specimens. A comparison of different needle types revealed that only the needle with a 2.5 mm pointed measuring profile and a slightly narrower shaft produced the same relationship between the two methods of measurement when different depth intervals were compared. With this needle, a correlation coefficient of 0.90 (N=88) was obtained. The accuracy of osteopenetrometer measurements was estimated to be approximately ± 10 per cent.

The blood supply of the arthritic knee during exercise

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The haemodynamic effect of the use of the limb on arthritic knees was investigated in nine immature dogs. Unilateral arthritis was induced by intra-articular injections of Carrageenin. The regional blood flow was measured by the microsphere tracer technique during alertness at rest, during exercise on a treadmill and 30 min post-exercise. Significant flow gradients were present in the normal knee. In the femoral epiphysis, subchondral flow rates were high compared to low central epiphyseal rates. In arthritis, the flow gradients were increased. Exercise caused significant re-distribution of the cardiac output from metaphyseal and epiphyseal bone to the striated muscles. Post-exercise, a three-fold increase of regional blood flow was found in the joint capsule of the arthritic knee and a significant hyperaemia was measured in the subchondral bone of the distal femoral epiphysis. It is suggested that the metabolic demands of the arthritic knees were not met during exercise. The resulting delayed hyperaemia of subchondral bone may be an important pathogenetic factor in chronic juvenile arthritis of the knee.