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Department of Orthopaedic Surgery, Lasarettet, S-221 85 Lund, Sweden

Supraspinatus tendon ruptures. A morphological analysis

Claes J. Petersson

Department of Orthopaedic Surgery, Malmö, Sweden

Two hundred and sixty-nine shoulder joints of 135 cadavers (73 men and 62 women), with an average age of 72 years, were scrutinized in three different dissection series.

In *the first series* the thickness of the supraspinatus tendon was measured at the level of the lateral acromion edge in 50 shoulders. Thirty-two shoulders were normal, nine had partial and nine had full-thickness supraspinatus tendon ruptures. A significant ($p<0.001$) decrease in the thickness of the supraspinatus tendons with full-thickness ruptures was found, whereas the thickness of tendons with partial ruptures did not deviate from normal tendons.

In *the second series* the length of the extramuscular portion of the supraspinatus, infraspinatus and subscapularis tendons as well as the intramuscular supraspinatus aponeurosis was measured in 49 shoulders. Thirty-five shoulders were normal, nine had partial and five had full-thickness supraspinatus tendon ruptures. There was a significant ($p<0.001$) increase in the length of the extramuscular portion of the supraspinatus tendons with partial or full-thickness ruptures. However, in ruptures, the total length of the extramuscular plus intramuscular supraspinatus aponeurosis was not increased, indicating muscular decay before rupture of the tendon.

In *the third series* the association between osteophytes of the acromioclavicular joint and supraspinatus tendon ruptures were studied in 170 shoulders. Partial supraspinatus tendon ruptures were found in 32 shoulders and full-thickness ruptures in 22 shoulders. Fifty-four per cent of the shoulders with supraspinatus tendon ruptures had distally pointing acromioclavicular osteophytes as compared with 10 per cent of normal shoulders. The difference is significant ($p<0.001$). Bony spurs of the anterior acromial process were also observed but they were less frequent than the acromioclavicular osteophytes.

Acromioplasty in the treatment of rotator cuff impingement

Jan Thorling, Håkan Bjerneld, Gunnar Hallin, Lennart Hovelius & Olle Hägg

Departments of Orthopaedic Surgery, Falun and Gävle, Sweden

In 51 patients with a painful arc syndrome of the shoulder refractory to conservative treatment, an acromioplasty according to Neer was performed. In 10 patients acromio-clavicular arthritis was found and in these patients the lateral end of the clavicle was resected as well. The patients have been followed up for an average period of 21 (range 6–52) months. The result was excellent (totally free of symptoms) and good (occasionally mild discomfort, but no limitation of shoulder movement) in 44 and 21 per cent, respectively. In 21 per cent, the result was fair (improved, but some pain persisted on shoulder movement) and in 15 per cent there was no improvement and the result was classified as poor. If a small amount of local anesthetic preoperatively infiltrated into the subacromial space gives temporary alleviation of symptoms, acromioplasty according to Neer seems to be beneficial.

Shoulder function in patients with recurrent anterior dislocation of the shoulder

L.-Å. Broström, E. Olsson & R. Wallensten

Department of Orthopaedic Surgery, Karolinska Hospital, Stockholm, Sweden

The function of the shoulder joint was examined in 20 patients with recurrent anterior dislocation secondary to trauma. The mean age was 31 years, and males predominated. Isometric and isokinetic strength (at an angular velocity of 30°/s) were measured in an isokinetic dynamometer (Cybex II, Lumex Inc., New York). Active and passive range of motion in the shoulder joint were registered.

For flexion, abduction and rotation there was a reduction (15 per cent) in range of motion.

An increased range of motion was observed in the "healthy" shoulder as compared to normal controls. In all patients the external rotation at 90° of abduction was more than 90° (mean 101).

Patients operated with the Putti-Platt procedure and postoperatively immobilized for 5 weeks (2.5 years follow-up) showed a decreased range of motion for external rotation (30 per cent) and a decreased strength for internal rotation (10 per cent).

Patients with a shorter (2 weeks) postoperative immobilization (follow-up 6 months) showed no reduction in strength for internal rotation.

Two year prognosis of primary shoulder joint dislocation in the young

L. Hovelius, K. Eriksson, H. Fredin, G. Hagberg, B. Lind, J. Thorling & J. Weckström

Departments of Orthopaedic Surgery in Gävle, Linköping, Falun, Malmö, Växjö, Karlstad and Örebro, Sweden

A prospective multicenter study on a series of 257 cases aged 12–40 years, with primary anterior shoulder joint dislocation showed that, compared to treatment with a sling and early movement, immobilization for 3–4 weeks did not lower the rate of recurrence after 2 years. At least 50 per cent of the primary dislocations at ages 17–19 years, and less than 10 per cent at ages 34–40 years, had recurred once or more after 2 years. Sex, physical activity and type of trauma were without prognostic importance regarding recurrence. Thirteen per cent of the shoulders, with a significantly lower incidence around the age of 20 years, had a simultaneous fracture of the greater tuberosity; none of these dislocations had recurred after 2 years. In at least 55 per cent of the cases, an impression fracture in the posterior part of the humeral head (Hermodsson 1934) could be demonstrated after the initial dislocation. This injury was without importance regarding recurrence at ages 22 years or younger.

Aspects on prognostic factors in comminuted and dislocated proximal humeral fractures

Olte Hägg & Bo Lundberg

Department of Orthopaedic Surgery, Gävle Hospital, Gävle, Sweden

The results of 33 III- and IV-part-fractures with and without dislocation have been analysed. Twenty-three were re-examined between 1 and 10 years postoperatively, and were classified and analysed according to the Neer system.

There were five III-part-fractures without and three III-part-fractures with dislocation, and six IV-part-fractures without and nine IV-part-fractures with dislocation.

The majority were treated by open reduction and the main method of internal stabilisation was temporary transfixation by Kirschner-wires. The overall result was 35 per cent excellent or satisfactory. In the IV-part-fracture group there were seven cases of total avascular necrosis, one pseudarthrosis and one case of humeroscapular arthrosis. Dislocation of the humeral head, however, did not seem to increase the risk of avascular necrosis.

In the III-part-fracture group, there was only one partial avascular necrosis of the humeral head.

All cases of total avascular necrosis were failures, mainly because of restricted motion. The majority, however, had negligible pain and were surprisingly satisfied with their function. They all declined the offer of prosthesis implantation. The results cast some doubt on primary implantation of prostheses in the IV-part-fracture group.

The results also suggest that good post-reduction anatomy tubercular fixation and early operation enhance the possibilities of healing and good function.

Total hip replacement in a Swedish county

G. Josefsson

Department of Orthopaedic Surgery, Gävle Hospital, Gävle, Sweden

The population in Gävleborg county is around 290 000. The number of primary total hip replace-

ments (THR) performed annually is about 320 (245 in Gävle and 75 in Hudiksvall). Around another 35 THR per year have been revised during the last 4 years. The reason for revision has mainly been non-septic loosenings, and principally loosenings of one or both components of the Christiansen prosthesis. The Christiansen-issue provided us with experiences of revisions but also initiated a search for another type of prosthesis which it was hoped would lead to a low rate of loosening. In January 1981, the first Exeter total hip was inserted. Since then, 210 primary Exeter-THR have been performed and the prostheses have been used in 24 revision operations. In a first comparison, 50 hips from the Exeter-group and 50 from the Lubinus-group, operated during the same period of time, were evaluated. After 6 months the Exeter hips showed a better range of motion and a lesser need for canes. Forty-three of 50 Exeter hips showed "equal" leg length after the operation, while the corresponding number in the Lubinus group was 22. The final long-term results are unknown but the preliminary results are promising. By performing 210 Exeter THR instead of the same number of Lubinus THR, the cost for implants was reduced by 126 000 Skr (600 Skr/THR).

Intravital studies of cement-caused bone tissue injury

Tomas Albrektsson & Lars Linder

Laboratory for Experimental Biology, Department of Anatomy, University of Gothenburg, Sweden

The titanium test chamber described by Albrektsson & Linder (1981) allows *in situ* descriptions of tissue injury caused by topically applied foreign substances such as bone cement. The bone and marrow tissue which has grown into a gap of the chamber is primarily inspected before application of the cement. Further registrations of the same tissue section are performed acutely and at repeated intervals a long time after cement insertion. In such a way, *in vivo* descriptions of the subsequently developing tissue injury become possible.

Immediately after insertion of the bone cement (Palakos-R, inserted 3–3½ min after mixing) there was a vascular injury as haemolysis and cessation of blood flow were noticed. Droplets probably containing air, some free monomer and fat substance were seen acutely in the tissue, in many cases localized intravascularly. Emboli of such droplets were seen leaving the observation field by vascular transport. An extensive fat cell resorption occurred in the weeks following cement insertion. Three to five weeks afterwards a minor phase of bone resorption was demonstrated.

The extent of tissue injury depended strongly on the fat cell contents of the tissue. In general, the more fat cells the more severe the tissue damage. In cases when the cement was inserted and where no medullary cells including fat tissue were present, the tissue injury was limited to a zone of a few hundred microns adjacent to the cement.

Ongoing experiments compare the extent of tissue injury after early and late insertion of the cement dough. In theory, early insertion of bone cement would mean a potential risk for increased leakage of monomer, causing more severe tissue injury. In practice, however, the preliminary results from this part of the study suggest that the possibly increased leakage of monomer is an academic factor in comparison with the presence or otherwise of fat cells, which seems to be much more important for the extent of the tissue injury.

Reference

Albrektsson, T. & Linder, L. (1981) A method for short- and long-term *in vivo* study of the bone-implant interface. *Clin. Orthop. Rel. Res.* **159**, 269–273.

Reoperated total hip prostheses in Sweden

Lennart Ahnfelt, Gunnar Andersson & Peter Herberts

Department of Orthopaedic Surgery, University of Gothenburg, Sweden

More than 46 000 THR have been performed in Sweden on more than 35 000 patients since 1967. The number of operations has increased continuously every year, and in 1982, 6 177 primary hip replacements were undertaken. The most widely used prostheses over the years have been the Charnley, the Lubinus, the Christiansen, the Brunswik and the Charnley-Müller devices. Today, 62 hospitals in Sweden perform this operation, and the Lubinus and the Charnley prostheses are most used.

Since 1979, more than 2 500 reoperations have been registered at the East Hospital in Gothenburg. The frequency of reoperations has increased during the last 2 years. The revision frequency for 1982 was 10 per cent. The diagnosis for reoperation is similar to that for primary arthroplasty. Arthrosis constitutes 76 per cent, seq. to medial hip fracture constitutes 14 per cent and rheumatoid arthritis 7 per cent. The main cause of revision was aseptic loosening of either one or both components. This cause has increased during the last 4 years. For the whole material,

loosening was the cause of reoperation in 50 per cent, infection in 11 per cent and dislocation in 21 per cent.

We have classified the different reoperations into four categories. The 1st category is revision or removal of the prosthesis and constitutes 74 per cent. The 2nd category is very extensive hip surgery, for instance explorative arthrotomy, open reduction or removal of ectopic bone. It constitutes 5 per cent. The 3rd category is smaller, surgical intervention, such as removal of cerclage wires or excision of fistulas (6 per cent). The 4th category is a special group, namely closed reduction after dislocation (15 per cent). Complications after revisions were more common than after primary arthroplasties. Almost 20 per cent of the revisions had a local complication; 10 per cent had a systemic complication and furthermore, 6 per cent had an operative complication to the revision.

Histochemical and ultrastructural analysis of the tissue reaction to bone cement in man

Lars Linder, Åke Carlsson, Lars-Gunnar Kindblom & Hans-Arne Hansson

Departments of Orthopaedic Surgery, Pathology and Histology, University of Göteborg, and Department of Orthopaedic Surgery, Malmö General Hospital, University of Lund, Sweden

The interface tissue surrounding both stable and loose cemented total hip prostheses was examined in a total of 43 patients undergoing revision surgery. Stable conditions were present in 15 patients. The interface in three of these was examined by electron microscopy. Twenty-eight patients had loosened prostheses; in five of these electron microscopy was performed. The remaining interfaces in both groups were examined by histology and enzyme histochemistry; ATPase, acid and alkaline phosphatase and NADH-diaphorase were the enzymes studied.

In prosthesis loosening, there was strong acid phosphatase activity in the membrane bordering the cement, reflecting the accumulation of macrophages in the interface tissue. The bone appeared viable and new bone formation was often seen, even in cases of loosening.

In the stable situation there was still some acid phosphatase activity, although less pronounced than in loosening. The tissue was viable. In some cases the soft tissue membrane, so prominent in loosening, appeared to be absent altogether, at least in some areas along the interface. This gives the interface a mosaic impression of alternating bone-cement and soft tissue-cement contact.

In three cases it was possible to verify the absence of a soft tissue membrane using electron microscopy. The interface anatomy nevertheless differed markedly from that between bone and an inert material such as titanium, suggesting that the bone cement has inferior biocompatibility.

The findings suggest that a soft tissue membrane adjacent to bone cement is not an inevitable feature, but the fact that in most cases it nonetheless develops indicates that an as yet unknown additional factor is at work.

Long-term results of Charnley THR

Björn Wejkner, Jan Stenport & James Hindmarsh

Department of Orthopaedic Surgery, Sos, Stockholm, Sweden

Our study concerns the clinical results of our first 325 Charnley Total Hip Replacements in 295 patients operated in a conventional operating theatre without "box" or prophylactic antibiotic treatment. The hips were clinically evaluated 5 and 10–14 years after the initial operation and the assessment was based on the Charnley numerical system. In this paper we mainly present the early and late failures.

At the 5-year assessment 54 hips had been lost to follow up, 42 had died, nine could not be traced and three could not be evaluated due to superimposed disease. Forty-two of the remaining 271 hips were rated as an early failure, giving a failure frequency during the first 5 years of 15.5 per cent.

During the first 1.5 years the operating theatre was of a very low standard and this was probably one of the reasons for a considerable number of early failures during this period, especially those caused by deep infections. Of the 271 hips followed for 5 years, 103 were operated on during this period, whereas the remaining 168 patients had their THR done after the initial 1.5 years. The frequency of failures in the former group was 25.2 per cent (26/103) and in the latter 9.5 per cent (16/168). In the latter group the causes of failures were: deep infection 8 (4.7 per cent), mechanical loosening 5 (3.0 per cent) and fracture of the femoral prosthesis 3 (1.8 per cent).

The hips of interest at the second follow up after an average of 11.5 years were the 229 which were considered to have a successful 5-year result. Sixty-five hips had been lost to follow up, 59, patients had died, three could not be traced and three could not be evaluated due to superimposed disease; 14 (8.5 per cent) of the remaining hips were rated as late failures. The causes were: mechanical loosening six (3.7 per cent), deep infection two (1.2 per cent), fracture of the femoral

prosthesis four (2.4 per cent) and unexplained pain two (1.2 per cent).

Our study has shown that when the arthroplasty was performed in an operating theatre of acceptable standard with the first generation Charnley prosthesis without antibiotic prophylaxis, and even before the importance of the cementation technique was fully documented, slightly more than 80 per cent successful results were found among the survivors at an average of 10–11 years postoperatively.

The Christiansen and Brunswik total hip prostheses – a 5-year follow up with regard to aseptic loosening

I. Lundgren & G. Josefsson

Department of Orthopaedic Surgery, Gävle Hospital, Gävle, Sweden

The Christiansen and Brunswik prostheses were both used from Feb. 1975 through July 1979 at the Orthopedic Department, Gävle Hospital. A total of 404 Christiansen prostheses were inserted, excluding revisions.

The patients operated in 1975 and 1976 have been followed, either until loosening and revision occurred, or for 5–6 years, including clinical and roentgenologic examinations. The review of roentgenograms was standardized. This study included 101 hips with the Christiansen and 56 with the Brunswik prosthesis. The choice of either type of prosthesis was purely a matter of the surgeon's preference. No plug in the medullary canal of the femur or cement syringe was used. An evaluation of the technique was made. The stem position in the femur, the degree of cement packing around the stem, the socket position and the amount of cement around the socket were registered, and in these respects there were no differences between the two groups.

The results were divided into four groups: 1. Loose and already revised prostheses; 2. Clinically and roentgenologically loose prostheses; 3. Asymptomatic hips with roentgenologically highly suspected loosenings, and 4. Intact prostheses. At the end of this study the 101 Christiansen implants were divided as follows: group 1:29, group 2:9, group 3:19 and group 4:44; that is, only 44 per cent could be classified as intact after 5–6 years. In the Brunswik group the results were: group 1:1, group 2:5, group 3:5 and group 4:45; that is 80 per cent were classified as intact. The difference between the groups is statistically significant ($p<0.001$). The Christiansen prosthesis seems also in this study to be associated with a high percentage of loosenings. It is remarkable too that many of the loosenings involved the socket. Of the 57 loosenings, 33 were isolated loose sockets and 10 combined loose sockets and stems.

The main reason for the high frequency of loosenings was probably the design of the prosthesis itself: the plastic chosen (Delrin), the small outer diameter of the socket as compared to the head, the varus angle between stem and neck and the sharp corners of the stem.

Localized endosteal bone resorption in the femur in failed total hip replacement

Åke Carlsson, Carl-Fredrik Gentz & Lars Linder

Departments of Orthopaedic Surgery and Diagnostic Radiology, Malmö General Hospital, and Department of Orthopaedic Surgery, Sahlgren's Hospital, Gothenburg, Sweden

Localized endosteal bone resorption (scalloping) in the femur after total hip replacement may be seen with deep infection, but it may also occur in cases with no infection. This study is based on the total material of first-time revisions of failed total hip replacements at Malmö General Hospital 1970–1982. The total material comprised 183 revisions, 66 of which were done because of deep infection. In 76 of the remaining aseptic cases, there was loosening of the femoral component, with or without loosening of the socket.

In the 76 femoral failures, scalloping was observed in 33 cases: In eight the scalloping first appeared about the proximal 1/3 of the stem; in two it started in the middle 1/3 and in 19 at the tip of the stem. In four cases it was not possible to determine the site of origin. In 25 of the 33 cases the scalloping increased in extent and size.

In 15 of the 19 distal scallopings, the tip of the metal stem was in direct contact with the endosteal bone immediately after surgery and the scalloping started in that area. In only four cases with distal scalloping was the tip of the stem surrounded by cement in the post-operative x-rays. However, later cement fracture brought the stem and the bone into contact.

In 37 mechanical failures without scalloping, the tip of the stem was in contact with the endosteal surface of the femur in 13 cases and surrounded by cement in 21 cases. In three cases the radiology was inconclusive.

It is suggested that distal scalloping in aseptic stem failure is the result of mechanical factors rather than wear of cement or articulating surfaces. A primary stem-endosteal bone contact appears to be a risk factor for the development of distal scalloping if loosening occurs. It is suggested that a centering device for the distal stem might help reduce the likelihood of

scalloping after hip replacement. Such a device should also be beneficial by providing stability of this part of the stem during cementing.

A new technique for total hip replacement

Urban Lindgren

Department of Orthopaedic Surgery, Huddinge University Hospital, Huddinge, Sweden

A lateral approach with release of the anterolateral part of the greater trochanter has been used. This trochanter osteotomy preserves the continuity between the gluteus medius and the vastus lateralis muscles and does not interfere with the piriformis and the short rotators. If properly performed, the following advantages are included: a wide exposure with minimal need for extra instruments and assistants; easy control of leg length; uncomplicated reattachment technique; minimal risk for non-union and late symptoms caused by the wires. The method can be used both for conventional hip prostheses and for the uncemented Lord prostheses. An interchangeable system has also been developed so that the best component can be chosen individually for the femur and the acetabulum at operation. This makes it more possible to treat difficult cases, whereas in routine cases it enables us to use the most conservative technique, which frequently includes uncemented components.

Results of the uncemented Lord hip arthroplasty

Olle Svensson, Gudmund Blomgren & Urban Lindgren

Department of Orthopaedic Surgery, Huddinge University Hospital, Huddinge, Sweden

The growing awareness of the negative side effects of methacrylate bone cement has caused an increased interest in cement-free total joint replacements. We have used the hip prosthesis designed by G. A. Lord since 1979.

Forty-two patients have been followed for a period of 6–42 months. In addition to radiographic follow up and ESR, the clinical condition was graded according to Charnley.

No infection or other serious complication was noted. The clinical results were comparable to those of conventional hip replacements. The radiographic follow-up did not reveal any case of complete radiolucent zone around the uncemented implants. However, remodelling bone-reactions seem to occur, which may be relevant for the long-term results.

These results indicate that today bone cement is not necessary for good results in joint replacement.

Cell injuries related to total hip arthroplasty

G. Blomgren, J. Blomberg & U. Lindgren

Department of Orthopaedic Surgery, Huddinge University Hospital, Huddinge, Sweden

Cell damage causes the liberation of intracellular enzymes into the blood. Many of these are used in the study of heart and liver diseases but are also influenced by surgical procedures. We wanted to clarify the enzyme pattern related to total hip replacement (THR) and total knee replacement (TKR), as this was considered important from the viewpoint of differential diagnosis and in order to study the effects of different factors at surgery.

Methods: The blood parameters studied were: GOT, GPT, CK, LD, ALP, gamma-GT, PTB and Bilirubin. The samples were taken pre-operatively, 3 days, 1,2 and 8 weeks after surgery.

Material: A total of 71 THR (47 cemented, 24 uncemented) and 22 TKR (six cemented, 16 uncemented).

Results: GPT and GOT reached peak values at 1 week and LD at 2 weeks postoperatively. An initial fall of PTB was noted. The value was later raised at 1 and 2 weeks because of a rebound effect. CK rose and fell in 1 week, reflecting the muscle trauma at operation. ALP reached its peak at 2 weeks, probably due to increased osteoblastic activity. All parameters generally returned to normal within 8 weeks. Bone cement in THR and TKR did not cause significant effects in the enzyme pattern, except that uncemented THR showed higher ALP ($p<0.05$), which was assumed to be a result of a negative effect of bone cement on the osteoblastic activity.

Conclusions: The postoperative enzyme pattern in total hip and knee arthroplasty demonstrates a characteristic time sequence.

The altered enzyme values are mainly produced by the local tissue trauma and by the blood transfusions.

The use of bone cement affects the enzyme pattern in a minor way.

On thromboembolism following total hip replacement in epidural analgesia. A controlled study of dextran 70 and low-dose heparin combined with dihydroergotamine

Hans O. Fredin, Bertil Rosberg, Måns Arborelius Jr. & Göran Nylander

Departments of Orthopaedic Surgery, Anaesthetics, Clinical Physiology and Radiology, General Hospital, Malmö, Sweden

Dextran 70 was compared with a new combination of low-dose heparin and dihydroergotamine (HDHE) in 116 patients allocated at random. The total blood loss and transfused amount of bank blood did not differ significantly between the two types of prophylaxis. Deep vein thrombosis was diagnosed with phlebography of the operated leg and pulmonary embolism with a combined study using perfusion and ventilation scintigraphy with ^{99m}Tc MAA.

The frequency of deep vein thrombosis of the thigh was significantly lower in the dextran group ($p<0.05$). However, the total frequency of deep vein thrombosis and pulmonary embolism did not differ between the two groups. No case of fatal pulmonary embolism occurred. The side effects were major bleeding complications in 7 per cent of the HDHE-group, as compared to none in the dextran group. Prophylaxis with haptendextran was used; no case of anaphylactic reaction was noted.

Clean air with and without dicloxacillin prophylaxis in total hip replacement

Gunnar Hallin, Urban Bengnér & Jan Thorling

Department of Orthopaedic Surgery, Falun Hospital, Falun, Sweden

A consecutive series of 416 total hip replacements without previous surgery were randomized into two groups – 228 with and 188 without dicloxacillin prophylaxis. All operations were performed according to a modified Charnley procedure by the posterior route in a theatre with horizontal air ventilation and with the team dressed in aspiration suits.

All hips which at the 1-year follow-up had so far shown no signs of complications (pain, elevated SR, pathological radiography, revision surgery) were judged not likely to have a peroperatively induced deep infection and were therefore discarded from further investigation. Hips with complications were evaluated according to a set of criteria as to whether the complication was of an infectious nature or not.

Ten cases (10/416, 2.4 per cent) were found to fulfil the criteria for proved, probable or suspected deep infection, one of which belonged to the dicloxacillin group (1/228, 0.4 per cent) and nine did not (9/188, 4.8 per cent).

This difference is not likely to occur by chance.

Comparison of a lateroanterior approach (Liverpool) and a lateroposterior approach (Moore) in operations for total hip replacement

Wolfgang Gammer & Eberhard Berg

Orthopaedic Section, Ludvika Hospital, Ludvika, Sweden

When using a lateroposterior approach in THR, it is often difficult to achieve a wide enough exposure of the acetabulum, especially when using the rather voluminous instruments for pressurizing cement and the Exeter acetabular cup introducer. This not infrequently necessitates large soft tissue dissections with a postoperatively less stable hip. At the Orthopaedic Section of Ludvika Hospital, one of the authors (W. G.) has therefore since October 1981 used a lateroanterior approach.

Method: With the patient on his side, a lateral incision is made proximally over the trochanter. The tensor fascia latae is split into the gluteus maximus. With one finger placed from behind under the gluteus medius, its fibres are bluntly separated approximately between its middle and anterior third. From there, the attachment of the gluteus medius is sharply split distally into the fascia of the vastus lateralis. The anterior attachment of the gluteus medius, together with the anterior part of the vastus lateralis attachment, are decorticized from the trochanter and brought ventrally. The femoral attachment of the gluteus minimus is cut and the anterior hip joint capsule is freed bluntly and excised, after which it is easy to dislocate the caput femoris. The posterior capsule can in most cases be left intact.

Results: The lateroanterior (Liverpool) approach has been applied to 30 THR using the Exeter prosthesis. The minimum follow-up is 6 months.

During approximately the same period of time, the other author (E. B.) performed 30 THR with the Lubinus prosthesis, using a lateroposterior approach. The results with regard to early dislocations, sciatic nerve injury, intraoperative loss of blood, operation time, postoperative stay in hospital and possible healing problems of the decorticized trochanter were recorded.

Conclusion: The lateroanterior (Liverpool) ap-

proach gives, with a minimum of soft tissue dissection, excellent access to the acetabulum without trochanteric osteotomy. It gives the advantage of a postoperatively stable and easily activated hip.

A rough surface as a cause of wear of the cup in the Christiansen total hip

Åcke Ohlin & Torvald Erikson

Department of Orthopaedic Surgery, County Hospital of Jönköping and Department of Machine Elements, Royal Institute of Technology, Stockholm, Sweden

The revision rate after Christiansen total hip replacement is just below 20 per cent after 6 years. In two out of three cases the loosening is an isolated cup loosening and is very often accompanied or preceded by excessive wear of the cup. Many orthopaedic surgeons believed this wear to be due to the polymer Delrin, the material used for the acetabular cup. However, study with light and scanning microscopes has subsequently demonstrated roughness of the femoral component. Christiansen heads are much rougher than Charnley heads. Frequent patches resembling cobblestones were noted on the surface of the Christiansen heads when viewed with the scanning microscope. These irregularities could even be seen with a pocket lens. The Charnley head surface is much smoother by comparison.

This roughness could explain the excessive wear rate seen in the Christiansen cups. We have also seen this excessive wear of a polyethylene cup in a Christiansen prosthesis after less than 1 year, indicating that head surface and not the cup was the factor causing the wear.

The excessive cup wear in combination with the relatively thin cup wall design seems deleterious for cup fixation.

Possible etiologies for the cup loosening are discussed.

The result of a strict program for operative treatment of gonarthrosis; four years of tibial osteotomies and arthroplasties

Bengt Hagstedt, Bjarne Linden, Stellan Wijkström & Tord H. Olsson

Departments of Orthopaedic Surgery and Radiology, Eksjö-Nässjö Hospital, Eksjö, Sweden

A programme for operative treatment of gonarthrosis, including high tibial osteotomy for early medial arthrosis and arthroplasty for the rest, usually with a Marmor hemiprosthesis, was formulated in the mid-seventies. This programme has been strictly adhered to since 1976, when the orthopaedic service in Eksjö started.

During the first 4 years, 37 osteotomies and 100 primary arthroplasties (77 medial, 18 lateral and five medio-lateral) were performed in 119 persons. These have been followed for 5–7 years and the outcome has been evaluated. Two osteotomies had to be transformed to an arthroplasty, one mediolateral Marmor prosthesis was exchanged for a Guepar device because of instability and one medial tibial plateau loosened and was exchanged for a new one. In one case, persistent patello-femoral symptoms disappeared after patellectomy. In one patient the patella dislocated postoperatively and reconstruction was not possible. There was thus a frequency of complications with serious consequences of less than 5 per cent. Although there were 14 cases of wound-healing problems of different kinds, no deep infection in the form of osteomyelitis or septic arthritis occurred. The rate of success in terms of pain relief and walking ability was in all types and stages around 0.85, except for stage 5 in which there were only 40 per cent good results.

It is concluded that this programme can successfully handle most types and stages of gonarthrosis. There is, however, a small but a defined group of patients that needs a prosthesis with inherent stability.

Results of a bicondylar knee-prosthesis

G. Onelius & S.-E. Keisu

Department of Orthopaedic Surgery, Gävle Hospital, Gävle, Sweden

During a period of 5 years from 1977 to 1982, 236 Townley prostheses were inserted at the Department of Orthopaedic Surgery, Gävle Hospital. In a retrospective follow-up study of these knees, we estimated their functional capacity, range of motion, stability and rate of complications and failures.

Of these 236, 50 knees on 42 patients were randomly selected for a thorough investigation regarding variables such as preoperative mobility, deformities and other reconstructional factors, as well as postoperative range of motion and stability, technical results and an overall subjective evaluation.

On X-ray, we measured the position of the components to establish the tolerance of this prosthesis. The consumption of postoperative ward resources was also estimated.

Our results indicate that this type of bicondylar prosthesis has a good ability to adapt to minor malpositions and yet give a good stability and range of motion for the activities of daily life.

Soft tissue problems in rearthroplasty of the knee joint

Anders Wigren & Lars Hakelius

Departments of Orthopaedic and Plastic Surgery, University Hospital, Uppsala, Sweden

Even if the results of knee arthroplasty are good, the complication rate is high enough to be a challenge to orthopaedic surgery. Most papers on complications deal with different types of prostheses and different methods of performing the arthroplasty or the arthrodesis, but few if any discuss the soft tissue problems.

During a 5-year period, 35 rearthroplasties were performed: four in OA and 31 in RA. Fifteen had a deep infection and most of them had a primary hinge prosthesis. 7/15 had a haematogenous infection, and so had a further one knee which has not been exchanged. There was usually a progressive osteomyelitis with loss of bone stock. Most cases had severe skin and soft tissue problems around the knee, with sinuses and adherent skin with multiple scars threatening the viability of the skin.

The mechanical failures, on the contrary, had very few soft tissue problems.

One or more sinuses existed in 10/16 infected knee arthroplasties. Healing disturbances of the soft tissue in connection with/or after the rearthroplasty were noted in 7/16 knees. Thus a subcutaneous fascial rupture was found in two knees and closed over continuous suction drains. In three knees an advanced pediculated musculocutaneous graft had to be used in connection with repeated revisions and suction drainage. Two knees needed only minor revisions. So far, all knees are without signs of infection. The functional result is satisfactory in 12 knees.

It is apparent that the condition of the soft tissue over the artificial joint strongly influences the functional result of a rearthroplasty. The position of the primary skin incision, hopefully not two incisions, is important for secondary surgery of the joint. In infection an early intervention to prevent loss of soft tissue over the joint is mandatory and very often there is a need for very individualized plastic surgery. In our material, repeated revisions often had to be used. The combination of specialized plastic surgery and orthopaedic technique may result in a functioning joint, even in advanced infected knee arthroplasties.

We recommend close cooperation between the orthopaedic and plastic surgeons in every infected knee arthoplasty when planning and performing the revision.

Renal impairment after total hip and knee replacement

Sven Collert & Johan Isacson

Department of Orthopaedic Surgery, Sabbatsberg Hospital, Stockholm, Sweden

At the Department of Orthopaedic Surgery, Sabbatsberg Hospital, in 1980 we observed three cases who unexpectedly suffered an episode of acute renal failure during the immediate postoperative period after total hip or knee replacement. The clinical picture was characterized by pronounced fatigue, loss of appetite, nausea and sometimes vomiting. All the patients recovered within 6 weeks.

As the cause of the renal failure was obscure, a prospective study was started in January 1981 on renal function in every patient undergoing total hip or knee replacement with the use of methylmethacrylate. As before, dicloxacillin was given pre-, intra- and postoperatively in the following doses: 1 g × 5 i.v. on the first day, 1 g × 4 i.v. on the second day and 1 g × 4 per os on the third day. Dextran was used as anticoagulant prophylaxis. Out of 278 consecutive cases in this series, we postoperatively noted an increase of serum creatinine to pathological values (mean 302 μmol/1, range 135–1278) in 35 patients (12.5 per cent). Thirteen of these patients were clinically affected and two patients had to have dialysis. There was one death, mainly because of renal insufficiency, but in all the other patients the renal impairment was reversible.

In April 1982, dicloxacillin was withdrawn and gentamicin-loaded cement was used as prophylaxis against infection. No other change was made. In the following 72 patients the serum creatinine level remained normal postoperatively in all cases. The difference is statistically highly significant ($P<0.005$).

The affected patients were somewhat older than the others (mean 76 and 69 years, respectively), but none of them had significant pre-existing renal disease.

There are no previous reports of dicloxacillin causing acute renal failure. One possible explanation of the renal impairment in our cases may be that the dose of dicloxacillin given (and recommended) was too high for these elderly patients. Another possibility is that the nephrotoxic effect was produced by interaction between dicloxacillin and some other agent(s) given in connection with the operation.

Avascular necrosis of the femoral head: A complication in the treatment of congenital hip dislocation

F. Sigrudsson & T. Aparisi

Department of Orthopaedic Surgery, Karolinska Hospital, Stockholm, Sweden

Despite extensive neonatal hip examination, some abnormal hips slip through the net and congenital hip dislocation or instability is in some cases not diagnosed until after several months. The earlier the diagnosis is established the lower the risk of treatment complication.

Avascular necrosis of the femoral head is a serious complication in the management of congenital dislocation and subluxation of the hip in young children.

The frequency of epiphysitis or avascular necrosis varies in different reports, as does the degree of recovery. Certain factors seem to influence the development of epiphysitis and a considerable decrease in frequency has been reported in series where pre-reduction traction and/or adductor-iliopsoastenotomy has been performed before hip reduction.

The present report is a retrospective, clinical and radiologic study of all cases treated at the Department of Orthopaedic Surgery, Karolinska Hospital, during 1972–1981. At the follow-up of 145 hips treated because of dislocation or instability we found 36 hips with radiologic signs of epiphysitis of the femoral head. All but one still showed signs of avascular necrosis at the last X-ray examination. Despite a mean observation time of 3.5 years, complete recovery was found in only one case.

Comparison has been made with hips without signs of epiphysitis in an attempt to elucidate the influence of factors such as contracted adductor muscles, open reduction, age at diagnosis, degree of dislocation, difficulties in reduction etc., in the development of avascular necrosis of the femoral head in young children.

Osteotomy *ad modum* Chiari – 6 years' experience

Krister Djerf & Henryk Tkaczuk

Department of Orthopaedic Surgery, Regionssjukhuset, Linköping, Sweden

Since 1977, 20 operations *ad modum* Chiari have been performed at the Department of Orthopaedic Surgery, University Hospital in Linköping. Twelve operations were performed on children aged 6–18 years. Eight osteotomies were performed on adults aged 24 to 46 years. Ten pelvic osteotomies were performed because of dysplastic hip-joints after treated or untreated congenital luxations of the hip. Four osteotomies were performed because of subluxations of the hip joint in spastic children or children suffering from myelomeningocele. One osteotomy was performed because of advanced Perthes' disease. Most of the adult patients had a subluxated or dysplastic hip joint after a congenital luxation in their childhood. One adult patient was operated on because of spastic diplegia and a subluxated hip-joint in the valgus position. The mean follow-up time after operation is 4 years. In all patients there was a considerable improvement, especially in pain in general and pain on loading. Trendelenburg's sign disappeared after the operation in nine patients. On one occasion there was a serious complication because of a paresis of the peroneal nerve.

The Boston thoracic brace in the treatment of idiopathic scoliosis. Initial correction

Eva Jonasson-Rajala, Elisabet Josefsson, Bo Lundberg & Henry Nilsson

Department of Orthopaedic Surgery and Orthopaedic Work Shop, Gävle Hospital, Gävle, Sweden

The Boston Thoracic Brace, i.e. a Boston Brace with axillary support, was used in the Department of Orthopaedic Surgery, Gävle Hospital for treatment of thoracic scoliosis in 44 patients in the period 1978–1982. The aim of the axillary support was to achieve better correction for curves above T 10. The mean initial correction with the Boston Thoracic Brace for apex T 8–9 was 15.9 ± 6.1° (54 per cent). The result was compared to both our 44 Boston Brace-treated patients from 1976–1982 with a mean initial correction of 30 per cent and our 15 Boston Milwaukee Brace-treated cases from 1976–1978 who showed an initial correction of 25 per cent. This was a great and significant improvement compared to the Boston Brace as well as the Boston Milwaukee Brace treatment. So far, the disadvantages with axillary support are limited. However, a few cases of high secondary curves have been roentgenologically observed. As the Boston Thoracic Brace is well tolerated by the patients and the initial correction for curves with apex T 8–9 is superior to Boston Brace, Boston Milwaukee Brace and Milwaukee Brace treatment, we recommend its use and further development on these lines.

Manipulation and strapping at talipes equinovarus

A. Svanström, Bo Lundberg & R. Wikmark

Departments of Orthopaedic Surgery and Physiotherapy, Gävle, Sweden

In our department, the widely accepted method of repeated manipulation for the conservative treatment of clubfeet has been supplemented by adhesive strapping to maintain reduction.

Between 1976–1981 correction was achieved in this consecutive series of 27 patients with 34 structural clubfeet after on average 20 days or nine visits to the physician-physiotherapist team. Nevertheless, relapse spoiled the promising results and made operation necessary in 23 of the 34 feet (67 per cent). However, improved technique led to quicker release in the last half of the period. In 13 the recurrence appeared as genuine, not before 2 months after convincing correction – only 4 could be controlled by casts – while in 8 it occurred more successively. In one case an early reaction to the procedure, swelling of the foot, necessitated interruption, in three others, despite this complication – also within the first week – treatment was not delayed.

Although the method gives excellent early control of the clubfoot, careful supervision is necessary and if the slightest indication of recurrence is revealed, periods of plaster after the age of 2 months are strongly recommended. As in primary treatment, the aim should then be to establish overcorrection.

X-ray diagnosis of fracture healing. A comparative study of 127 human tibial shaft fractures

Richard Hammer, Staffan Hammerby & Paul Edholm

Department of Orthopaedic Surgery, University of Linköping, Sweden

In the present study the radiologist's ability to determine effective osseous union by x-ray alone was evaluated. Of a total of 167 conservatively treated tibial shaft fractures, with an uncomplicated healing course, 127 were selected at random for this study. During the healing process, fracture stability was measured by a non-invasive technique (shift-comparison). By this method it is possible to define when the fracture is healed, i.e. the stability in the fracture area is sufficient to transmit the forces induced during unsupported normal gait without running the risk of re-fracture or other healing disturbances. Seven radiologists with an average experience in practice of 11.1 (range 4–28) years were asked to classify the stage of healing in five different groups. X-rays on which this classification was based were exposed at the time when 103 of the fractures were stable and 24 were unstable. Of the stable fractures 70.9 per cent were classified as definitely not healed or the stage of healing was uncertain. Only 21.9 per cent were classified as definitely or probably healed. In the unstable group, 18.5 per cent were classified as definitely healed.

The conclusion of this study is that the classification of the stage of healing is very unreliable when based on conventional x-ray. Furthermore, the amount of callus formation as well as the visibility of the fracture line is badly correlated to the mechanical properties of the fracture.

A device for detection of instability of osteosyntheses of femoral neck fractures

Hans Olofsson & Lars Rehnberg

Department of Orthopaedic Surgery, University Hospital, Uppsala, Sweden

During operation for osteosyntheses of femoral neck fractures, a device is used to detect instabilities of the reduced fracture. If these instabilities are uncorrectable the operation is completed with a hip replacement arthroplasty at the same operation.

The device consists of a rod which has a strain gauge attached to it. This strain gauge is connected to a plotter through an amplifier. The device can record very small deformations in the fracture site and therefore it is enough to load the leg axially with 100 N to get a usable reading on the plotter.

We use the method of von Bahr for osteosyntheses, where impact hammering of the fracture segment plays a role. At present, we are investigating the effect of impact hammering on the stability of the osteosyntheses. A prospective study on femoral neck fractures is also being performed using this device.

Operated ankle fractures in Eksjö, 1978–1981

Claes Olerud, Håkan Molander, Tord Olsson & Bengt Hagstedt

Departments of Orthopaedic Surgery and Radiology, Eksjö, Sweden

Open reduction and internal fixation is the method of choice in treating ankle fractures, since anatomical

reduction of the mortise joint is mandatory for good prognosis. Several different methods are available.

The purpose of this study is to get a picture of the results after treating ankle fractures, supination as well as pronation injuries, with cerclage wire, staples and pins. We therefore examined the patients with ankle fractures in Eksjö in 1978–1981 with regard to: (1) classification according to Lauge Hansen, (2) operative success expressed as anatomical reduction on postoperative radiographs and (3) the patients' "disability" 6–54 months after the injury. "Disability" was defined as presence of pain or stiffness and impaired ability to run, jump or climb stairs. These parameters were then correlated to one another. In our material of 237 patients, 138 were severe (multicomponent) injuries and 99 were simple (monocomponent) injuries. The incidence of operated ankle fractures was approximately 1.2. per mille. The three most common injuries were SE II, SE IV, and PE IV. Anatomical reduction was seen in 43 per cent of the severe injuries and 75 per cent of the simple ones. It was also higher in the group with non-anatomical reduction than in the group with complete reduction.

Fixation of fractures in the distal third of the femur with the compression supracondylar plate

Hans Granhed, Ulf Lindenberger & Hans-Olof Svensson

Department of Orthopaedic Surgery, Sahlgren Hospital, Gothenburg, Sweden

The treatment of fractures in the distal third of the femur is controversial and varies from conservative management to open reduction and internal fixation. However, complications from all kinds of treatment are frequently reported.

Material and Methods. From Dec. 1979 to Feb. 1982, 22 patients with 22 fractures and two pseudoarthroses located in the distal third of the femur, both with and without intraarticular extension, were treated with open reduction and internal fixation with the Richards compression supracondylar plate. The ages ranged from 22 to 89, and 13 patients (60 per cent) were 70 years old or older. All fractures in the younger patients were caused by high energy trauma or violence. In the older patients the fractures in high frequency were associated with osteopenia resulting from previous disease or injury; these fractures resulted from low energy trauma. The minimum follow up was 12 months. The results were evaluated according to Neer's criteria (*JBJS* 1967).

Results. Seventeen patients were available for the follow-up study; five had died 1–17 months after surgery, none related to the procedure. In 16 of the 17 patients the fractures healed in a satisfactory anatomic position. One patient required a second procedure due to infection and pseudoarthrosis. No case of failure of fixation occurred. By Neer's criteria, the results were rated as excellent in 11 patients (60 per cent), satisfactory in 4 (29 per cent), unsatisfactory in 1 (6 per cent), and failure in 1 (6 per cent).

Conclusion. Internal fixation with the Richards compression supracondylar plate is an acceptable method of treatment of fractures located in the distal third of the femur. Good results are achieved even in patients with osteoporotic bone.

Femoral neck fractures treated with von Bahr screws

S. Lindeqvist, B. Malmqvist & L. Hovelius

Department of Orthopaedic Surgery, Gävle Hospital, Gävle, Sweden

During the years 1978–1981, 237 patients with 241 intracapsular hip fractures were operatively treated with the von Bahr device, at the orthopaedic department, Gävle Hospital. In 130 cases (group 2) a third screw was added at random. Group 1 (two screws) consisted of 111 cases (85 females, mean age 80 years). Group 2 consisted of 130 cases (97 females, mean age 83 years). The two groups had the same composition (76 per cent) of type III and IV fractures as classified by Garden.

At follow-up 2–5 years after surgery, 40 per cent of the group 1 patients and 30 per cent of the patients in group 2 were deceased. In group 1, 31 patients (28 per cent) had been operated on with prosthetic replacements (20 patients within 1 year, and a further six, three and two patients after 2, 3 and 4 years, respectively). In group 2, 23 patients (18 per cent), had prosthetic replacement performed during the follow-up period (16 patients within 1 year, and four and three patients after 2 and 3 years, respectively).

Groups 1 and 2 did not otherwise differ at follow-up regarding the number of operations required to remove troublesome screws (15 in group 1, 17 in group 2) or daily living.

Conclusion: Even if the difference between group 1 and group 2 (28 per cent prosthetic replacement compared to 18 per cent) is not statistically significant, we find support for the idea that better results will be obtained with a third screw when using the von Bahr device for intracapsular hip fractures.

Angulation osteotomy in non-unions of the femoral neck

U. Lindsjö, G. Danckwardt-Lilliestrom, K. Kolstad & S. Olerud

Department of Orthopaedic Surgery, University Hospital, Uppsala, Sweden

If the angle of inclination in a fracture of the femoral neck is more than 50° a large amount of shear forces will be acting at the fracture plane when the fracture is under load. Pauwels (1935) called attention to this biomechanical problem, and designed the principles for angulation osteotomy with the aim of changing the force interplay at the fracture. The method has been further developed by Blount (1952) and Müller (1977).

Material and Methods. Four cases of non-unions of the femoral neck after trauma are demonstrated: Two men, born in 1959 and 1946, respectively, and two women, born in 1918 and 1902, respectively. The patients were operated on 3, 9, 12 and 26 months after the trauma. At the operation, a valgus angulation osteotomy was performed, with the use of an angulation plate according to the AO principles.

Results. In all cases the fracture and the osteotomy healed clinically and roentgenologically. There was no necrosis of the femoral head or any posttraumatic arthrosis. All patients were mobilized with weight-bearing and the functional end results were good.

Discussion. In steeply falling fracture lines in the femoral neck there is a great risk of non-union, especially if the biomechanics of the fracture have not been taken into account at the primary operation. If the fracture has not healed 4–6 months after the initial operation, an angulation osteotomy should be considered. With the help of Garden's classification (1959/61), the risk of damage to the vessels to the femoral head can be judged. If there is any doubt about the viability of the femoral head, a scintigraphic investigation should be done preoperatively. The aim of the angulation osteotomy is to eliminate the shear forces in the fracture by reducing the inclination angle of the fracture line to more than 60° to the longitudinal axis of the femur. If this reduction is achieved the non-union will be loaded under compression instead of shear during weight-bearing. Further, this compression combined with the high stability of the internal fixation with the AO plate promotes fracture healing. Angulation osteotomy according to Pauwels, Blount and Müller is a useful method for treatment of non-unions of the femoral neck, especially in younger patients with a viable femoral head and without radiologic signs of arthrosis in the hip joint.

Back school for low back pain

Stig Lindeqvist, Bo Lundberg, Gun Lööf & Rut Wikmark

Departments of Orthopaedic Surgery and Physiotherapy, Gävle, Sweden

A promising effect on the duration of sickleave in a selected material of low back pain patients using only prescriptions as to regime and information has earlier been reported. In order to ascertain the value of such measures on an unselected group of patients and over a longer period of time, a prospective randomized study has been completed. Of 56 patients, 24 went through a program of information and training concerning the disorder while the 32 in a control group – even if seen regularly – did not get this intense attention. The results in terms of duration of symptoms, sickleave and recurrences during 1 year were evaluated and compared at follow-up.

The two groups were found to have the same characteristics. No significant differences could be demonstrated concerning either the initial duration of distress and sickleave, or the number of recurrences and their duration during the observation year. Our interpretation of this lack of positive effect is that in this more heterogeneous population the procedures used have less influence. However, there were more patients with periods of sickleave for different other reasons in the control group. Even if sickleave due to other disorders is known to occur more often in association with the back pain patients, the difference cannot be rationally explained. Not surprisingly, the regime group of patients was also more satisfied with the information given.

Wedge excision in infected below-knee amputation stumps

Margareta Kronberg & Pelle Netz

Department of Orthopaedic Surgery, Danderyd, Sweden

During 1982, at our clinic, 88 primary major amputations were made on 80 patients with arterial insufficiency. Forty per cent of the patients were diabetics. Sixty-five of the operations (74 per cent) were below-knee amputations: out of these nine were reamputated at a higher level, and seven were revised at the same level. Four of the revisions were made as wedge excisions of the necrotic and/or infected tissue. At the wedge excisions, the patient was given antibiotics, the wound was sutured primarily, and the stump was peroperatively put in plaster. All four patients healed

without any sign of infection and received a prosthesis within 4–10 weeks.

The technique, previously described by Murdoch, is included and the four cases are presented. In our opinion, the wedge excision technique will, in many cases, make it possible to save the knee and the stump length, also in severe healing complications after below-knee amputations.

Charcot breakdown of the diabetic foot

Acke Jernberger

Department of Orthopaedic Surgery, Centrallasarettet, Norrköping, Sweden

Spontaneous and pathological fractures are common among diabetics with neuropathy, but mostly the diagnosis is not made during the acute phase. Later, the destruction becomes visible when an X-ray is taken for some reason.

The innocent trauma and the very slight pain from the insensitive, neuropathic foot does not make the physician suspect a fracture, and the red, hot, swollen and painful foot is taken for erysipelas.

The course of the disease and the treatment in some cases with PTB-orthoses are demonstrated.

Entrapment of the suprascapular nerve

Carl-Göran Hagert & Lars Linder

Section of Hand Surgery and Department of Orthopaedic Surgery, Sahlgren's Hospital, Gothenburg, Sweden

Entrapment of the suprascapular nerve is a recognized clinical entity, although its prevalence is not known. It may occur as a sequel of direct or indirect trauma to the shoulder, but may also appear without obvious trauma (Kopell et al. 1976).

This material consists of 11 patients who have undergone decompression of the suprascapular nerve. The operations were performed by the senior author (CGH) between 1978 and 1982. Follow-up time was 1 year or more in nine cases; 2 years or more in four cases.

The dominating subjective complaint was a poorly localized shoulder ache, disturbing sleep. The duration of symptoms was 2 years or more in seven cases, and 1 year or more in nine cases. Most patients had previously sought medical advice; diagnoses included cervicalgia, brachialgia and atypical TOS. In 5/11 cases there was a preceding trauma to the shoulder: one traction injury, one clavicular fracture and three contusions to the shoulder. In 6/11 cases there was no trauma.

Objective findings were weakness of the supra- and/or infraspinous muscles, often wasting of the same muscles, and localized tenderness at the scapular notch. Preoperative EMG was obtained in seven cases: five showed definite signs of peripheral neuron injury; two were inconclusive.

Treatment was sectioning of the transverse scapular ligament. No widening of the notch was made. Operative findings were positive in 7/11 cases (local narrowing of the nerve) whereas 4/11 did not show obvious abnormality.

The most dramatic effect of the operation was prompt disappearance of the ache. This occurred in 10/11 patients; in the 11th ache clearly diminished. Muscle weakness improved more slowly but the weakness was of no concern to the patients. Two patients still had pain on motion, and in one a concomitant rotator cuff injury was later diagnosed. In one patient the shoulder ache reappeared after 1 year following trauma to the head and neck.

It is concluded that suprascapular nerve entrapment should be considered as a differential diagnosis in cases with ache in the shoulder region.

Reference

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Clavicular erosion resulting from fixation of acromioclavicular separation with a "dacron double velour ligament prosthesis"

Hans-Olof Svensson, Jan Lidström & Hans Granhed

Department of Orthopaedic Surgery, Sahlgren Hospital, Gothenburg, Sweden

The treatment of traumatic dislocation of the acromioclavicular joint is highly controversial, and varies from strict conservative management to many different surgical repairs.

At the Sahlgren Hospital, Gothenburg, a method of open reduction and coracoclavicular wiring was previously used (Ejeskär, *Acta Orthop. Scand.* 1974). Starting in 1981, 10 patients with complete separation were treated with open reduction and coracoclavicular fixation with "double velour dacron ligament pros-

thesis", which are marketed specifically to prevent "cortical sawing" (Meadox Medical Inc.).

The initial results were good. However, a year or longer after surgery, four patients have sustained fractures of the lateral clavicle at the site of the dacron band. All the remaining patients seen at follow up have roentgenologic signs of bony erosion at the same site. We assume this to be the effect of the rise in stress, which contributed to the fractures in the others.

Therefore, if surgical management of complete acromioclavicular separations is preferred, some other method should be selected.

Result after 2–5 years with the Bristow-Latarjet procedure for recurrent anterior dislocation of the shoulder

L. Hovelius, C. Åkermark, B. Albrektsson, E. Berg, P. Herberts, L. Körner, B. Lundberg & T. Wredmark

Departments of Orthopaedic Surgery in Gävle, Linköping, Huddinge, Gothenburg and Ludvika, Sweden

A follow-up study in 112 cases with recurrent anterior shoulder joint dislocation operated with transfer of the coracoid process (Bristow-Latarjet) demonstrated 6 per cent recurrence after 2–5 years; in 10 per cent of the whole series further surgery had been performed for various reasons. Ninety per cent of the patients considered the result as excellent or good. The technical performance of the coracoid transfer was important for the result. Procedures in which the transplants had migrated >1.5 cm or had healed in too medial a position in relation to the glenoid rim showed significantly worse results at follow-up regarding recurrence or subluxation.

Micro-capillary infusion technique for measurement of intramuscular pressure

Jorma Styf & Lars Körner

Department of Orthopaedic Surgery, East Hospital, Gothenberg, Sweden

The purpose of this study is to describe and evaluate the microcapillary infusion (MCI) technique for intramuscular pressure measurement at rest and during exercise. The properties of the MCI method were also compared with those of the wick catheter method and conventional infusion techniques using a pump. It is known that muscle relaxation pressure during exercise is a valuable parameter for both clinical and research purposes, e.g. in investigations of chronic compartment syndromes and in ergonomic studies of muscle force.

Method: 32 patients took part in the study. With the patient lying on the back, with the feet on spring-braked pedals, which allowed measurement of the amount of work done, a specially prepared polyethylene catheter Ø 1.05 mm was introduced into m. tib. ant. via a Venflon set. The catheter was connected to the pressure recording system and an infusion pump giving 0.7 ml/24h–3 ml/h, or a MCI set giving 1.5 ml/h–3 ml/h. The intramuscular pressure was recorded during 30 min of rest and for 30 min during exercise. In six patients a wick catheter (Myocath ®) was also introduced in the same muscle 10 mm away from the infusion catheter.

Results: The conventional infusion technique with a pump gave a good dynamic response during exercise if the infusion rate was 1.5 ml/h or more. The MCI system gave a better dynamic response and was less sensitive to disturbances. There were no changes in the resting pressure during 30 min at any of the infusion rates applied. The wick catheter gave a very low or no pressure amplitude at all during exercise. The pressure delay was 6–30 s with the wick catheter. The wick pressure obtained was equal to the muscle relaxation pressure plus half the pressure amplitude obtained with the MCI system. The pressure amplitude recorded with the MCI technique was well correlated with the amount of work done.

Conclusions: Infusion systems are better suited for dynamic pressure recordings than wick catheters. The wick method does not allow monitoring of the muscle relaxation pressure during excercise. There is no evidence that the infusion raises the resting pressure of the muscle. The MCI method is superior to the conventional infusion technique as it offers lower compliance in the pressure system and thus a better dynamic response.

The relation between muscle trauma, serum enzymes and impaired function

Jan Thorblad, Jan Ekstrand, Jan Gillquist & Bo Sörbo

Departments of Orthopaedic Surgery and Chemistry, Linköping, Sweden

Traumatic injuries to muscle are common in exercise and sports as well as in daily life. There are difficulties in diagnosing the extent of a fresh injury and in distinguishing rupture of muscle from a connective tissue haematoma. The lack of diagnostic precision

makes rehabilitation and judgement about prognosis difficult. Therefore, we wanted to test analysis of some serum enzymes as a means of improving diagnosis.

Method: 30 soccer players and 30 non-athletic patients who attended the emergency department because of suspected rupture were studied. The serum enzymes CK, CK-B, LD, ASAT and ALAT were followed daily for 6 days after the trauma. Impaired function was measured as the number of days away from training or work.

Results: CK-B, LD, ASAT, and ALAT were not influenced by muscle trauma. A rectilinear relation was noted between the peak value of CK and number of days away from training or work. The peak of CK was noted 2–3 days after trauma. CK was usually normalized after 1 week.

Conclusion: An initially high CK-value seems to be correlated to absence from training or work. The CK-value may therefore estimate the degree of muscle trauma and could be used as a prognostic aid which may speed up rehabilition.

Influence of bone marrow, direct current and growth hormone on bone formation by demineralized bone matrix in the rabbit, evaluated by technetium radionuclide bone imaging

K.-G. Thorngren, J. Wittbjer & M. Rohlin

Departments of Orthopaedic Surgery, Maxillo-Facial Surgery and Oral Roentgenology, University of Lund, Lund, Sweden

The osteogenetic potentials of autologous bone marrow as well as of demineralized diaphyseal compact bone are well documented. The interpretation of marrow influence in osteogenesis of a decalcified bone transplant differs, however. The influence of direct current and growth hormone on decalcified transplants in a bone defect has not previously been studied. The aim of this investigation was to find out to what extent these potential bone stimulating agents would contribute to the osteogenesis of a decalcified bone transplant and thus accelerate the healing process in a bone defect.

Adult male rabbits were operated with bilateral resection of a 12 mm piece of the middle part of the radius. No postoperative fixation was necessary due to the stabilizing effect of the ulna. Both pieces were decalcified and at a second operation 3 days later the decalcified pieces of bone were replaced in the radial defects on both sides. Autogenous fresh marrow cells obtained from the femoral medullary cavity by aspiration through a drill hole were administered to one implant side. In other experimental series, instead of bone marrow supplement, direct current was applied or continuous infusion of growth hormone via an implanted osmotic pump was given. The contralateral defect with decalcified bone transplant served as control. At 14 and 28 days postoperatively the bone formation activity was registered by scintigraphy, radiography and autoradiography.

The defect retransplanted with a composite graft with bone marrow had at 14 days a significantly higher ($p<0.01$) bone formation rate compared to the control defect. At 28 days no differences were found between the sides. Thus, added bone marrow seems to have an initial effect on the osteogenesis, while in a later phase no differences in bone formation or total amount of formed bone were seen between the bone matrix alone and the composite graft. The effects of direct current stimulation and growth hormone administration to bone matrix in a defect without bone marrow supplement were minor.

Effect of the antineoplastic agent methotrexate on heterotopic new bone formation in rats

L.-Å. Broström, F. C. H. Bauer, O. S. Nilsson & U. Nilsonne

Department of Orthopaedic Surgery, Karolinska Hospital and Huddinge Hospital, Stockholm, Sweden

Recent advances in the treatment of osteogenic and chondrogenic tumors have stimulated efforts to perform limb-saving rather than ablative surgery in such cases. However, this has also caused new problems since in many cases bony union will have to occur during concomitant chemotherapy, and chemotherapeutic agents are known to cause weakening of bone leaving the patients vulnerable to fracture. It is a common finding that fracture healing seems to be considerably delayed or even completely inhibited under these circumstances.

In an attempt to study how this negative effect of adjuvant chemotherapy on new bone formation might be modified, we have analyzed the effects of methotrexate on experimental heterotopic bone formation. We have utilized the well-established method of inducing heterotopic new bone formation by implanting pieces of demineralized bone matrix in soft tissue in rats. Methotrexate was administered as a single i.v. injection at the initiation of the induction process.

A slight transient weight arrest was noted in the methotrexate-treated animals. As a measure of new

bone formation during 3 weeks after the methotrexate injection, the amount of ash in the implants was recorded. This was found to be reduced by 62 per cent and 72 per cent in the groups treated with 100 or 250 mg/kg BW methotrexate, as compared with a control group. As a measure of the persisting effect of the agent the short-time incorporation of radionucleotides was used. Both the uptake of ^{45}Ca taken as a measure of mineralization, and of 3H-proline as a measure of collagen synthesis were greatly reduced in the heterotopic bone from the animals treated with the cytostatic agent. However, the incorporation of these compounds in orthotopic bone was considerably less affected.

The results indicate a pronounced effect of methotrexate on new bone formation, and this effect seems to persist for at least 3 weeks after the treatment.

CPM machine for the upper extremity

Sven Olerud

Department of Orthopaedic Surgery, University Hospital, Uppsala, Sweden

Continuous passive motion has proven its value both experimentally and clinically. So far we have only had an apparatus for the lower extremity. However, recently the Toronto group (led by Bob Salter) presented a convenient machine for the upper extremity, which we have now used for some time.

The indications have so far been joint fractures which have been stabilized with internal fixation, permitting unloaded exercise. Other indications are metaphyseal fractures to the humerus, forearm fractures, synovectomies to the elbow, etc.

The apparatus is electrically safe as it is battery driven. It permits motion in the elbow joint from 0–140° at the same time as the forearm rotations switch from pronation to supination around 150–180°. The apparatus is adjusted to the patient immediately after surgery when the patient is still asleep. Thus, it is usable in bed as well in the upright position. It can even be used by the ambulatory homebound patient.

The apparatus seems to be extremely valuable for the treatment of different musculoskeletal disorders to the upper extremity, and all the indications for its use have probably not yet been determined.

Influence of indomethacin on new bone formation in rats

H. Törnkvist, F. C. H. Bauer & O. S. Nilsson

Departments of Orthopaedic Surgery, Huddinge Hospital and Karolinska Hospital, Stockholm, Sweden

Indomethacin has been reported to retard fracture healing in experimental models. Clinically, indomethacin has been given to prevent heterotopic ossification complicating total hip arthroplasty. To investigate a possible dose-dependent effect of indomethacin on osteogenetic activity, we induced new bone formation by implanting demineralized cortical bone into muscle pouches of rats. This method reliably causes a proliferation of mesenchymal cells around the implant, followed by chondro- and osteogenesis in and around the demineralized bone matrix.

Thirty rats were divided into five groups and treated for 4 weeks with subcutaneous injections of NaCl, 0.5, 1.0, 2.0, or 3.0 mg/kg/day of indomethacin, respectively, starting 1 week before implantation of the demineralized bone. Three weeks after implantation ^{45}Ca and ^{3}H-proline was given and 24 h later the animals were sacrificed. Teeth femurs and implants were collected and analyzed in respect of ^{45}Ca and ^{3}H activities and ash weight to assess osteogenesis.

Serum levels of indomethacin were comparable to those presented in previous studies. There was no effect of the drug on teeth or femurs. In implants, the amount of ash was reduced by about 25% in rats receiving 2 or 3 mg/kg/day of indomethacin. The ^{45}Ca activity calculated per implant was considerably less affected, and as a consequence the ^{45}Ca specific activity was raised in these two groups. The uptake of ^{3}H-proline was parallel to ^{45}Ca in implants as well as femurs and teeth in all groups.

In conclusion, high doses of indomethacin decrease rapid new bone formation without disturbing normal bone growth. This inhibitory effect may be transient since the metabolic activity at the end of the experiment was similar in all groups.

New bone formation in devitalized isogeneic bone transplants supplemented with bone morphogenic protein

P. Köhler, F. C. H. Bauer & A. Kreicbergs

Department of Orthopaedic Surgery, Karolinska Hospital, Stockholm, Sweden

In an experimental study on the rat, new bone formation was studied in devitalized (autoclaved) isogeneic

bone transplants supplemented with decalcified, freeze-dried and milled allogeneic bone (Bone Morphogenic Protein – BMP) as compared to new bone formation in allogeneic bone transplants.

The study included 130 animals (140 g male Lewis rats). The transplants were placed in the muscles of the abdominal wall. The animals were sacrificed with CO_2 3, 6 and 9 weeks postoperatively, having been given intravenous injection of ^{45}Ca (10 μ Ci/animal) 24 h earlier. Immediately, postmortem the transplants were collected for determination of relative ^{45}Ca activity after calcination (counts per mg ash-weight) and for histological as well as radiological examination. Maximum ^{45}Ca activity was noted at 3 weeks. Further analysis disclosed that the isogeneic transplants + BMP consistently exhibited 8–10 times higher ^{45}Ca activity than the allogeneic transplants. This reflection of a higher new bone formation activity in the devitalized isogeneic transplants + BMP was confirmed by histomorphological and radiological examination.

The results indicate that it might be possible to reimplant resected, devitalized tumorous bone and attain incorporation.

Rating systems in the evaluation of knee surgery

Yelverton Tegner, Jack Lysholm & Jan Gillquist

Department of Orthopaedic Surgery,
Regionsjukhuset, Linköping, Sweden

Simple categorization into excellent-good-fair-poor can easily be biased by factors unrelated to the result. Other methods are those using either numerical rating systems or expressing yes/no answers to a number of questions. We have used a numerical rating system in our follow-up studies after ligament and meniscus injuries in the knee joint. This "scoring scale" was first carefully tested (Lysholm & Gillquist 1982). A few other scoring scales have appeared in the literature, some of them however without documentation. The object of this paper is to analyze differences between some common evaluation systems, and to identify possible advantages and disadvantages of our scoring scale.

Sixty-four patients (mean age 26.7 years) with tears of the ACL were evaluated with different systems rating knee function. Our scoring scale correlated significantly to Marshall's scoring scale ($r = +0.72$), although more patients had high scores ($p<0.001$) because clinical findings are included in Marshall's score. Our opinion is that this jeopardizes the *functional* evaluation. We prefer to register clinical findings separately. Our scoring scale was also compared to two binominal rating systems (yes or no answers), a Venn diagram system (using "instability", "pain" and "swelling") and another with the same items as in our scoring scale. With a Venn diagram system no significant difference compared to our score was found in the ability to detect unsatisfactory results, but the Venn diagram system provided significantly less information about the grade of incapability. Within the score range 90–60 a progressively lower total score is obtained by an increasing number of pathological items, but outside this range a decrease in total score is usually explained only by a lower rating in the items pain or instability. The score correlated well to the patients' opinion of their knee function, and to an 11-level activity grading system ($p<0.001$ and 0.01).

In conclusion, our scoring scale gives a more differentiated evaluation of knee function than the Marshall score and binominal rating systems. The score is useful for evaluation before and after treatment in the same group of patients or for comparison of different treatment routines in randomized studies. It is, however, not intended for comparison of the grade of disability between different groups of patients with different diagnoses.

A test for evaluation of knee function

Yelverton Tegner, Jack Lysholm, Marketta Nordin, Jan Gillquist & Sten-Ove Ringborg

Department of Orthopaedic Surgery,
Regionsjukhuset, Linköping, Sweden

In the follow-up of treated knee ligament injuries, we have used a functional scoring scale evaluation. In early follow-up studies, patients who have not yet resumed their sports may receive a false high score, as they still do not fully know the functional status of their previously injured knee. We have therefore developed a number of functional tests as a complement to the score.

The following functional tests were used:
(1) One-leg-length-jump. The quotient between the best result (three attempts) for the injured and the un-injured leg is calculated. (2) Running 40 m in two figures-of-eight. Turns both to the right and to the left are included. Electronic time-keeping is used. The photo-electric cells are arranged to allow time-keeping for straight-ahead-running and turning separately. (3) Running up- and down-hill (55 m each). In up-hill running a right and in down-hill running a left bend is included. Electronic time-keeping is used. Running times up- and down-hill are registered separately. (4) Running up and down a spiral stair-case. Time-keeping is arranged as in (3).

Sixty-four patients with old knee ligament injuries were examined. A knee score evaluation and a Cybex-2 test of the thigh muscle strength were also carried out. Uninjured soccer-players were examined as controls. All running tests correlated significantly to the muscle strength. In general, the correlations were stronger at an angle velocity of 180°/s compared to 30°/s. Patients with knee injuries had significant problems when turning in the figure-of-eight running, resulting in a significantly longer running-time for this specific part of the test compared to healthy controls. The jump quotient was significantly lower for patients with knee injuries compared to healthy controls ($p<0.001$), and was correlated only to the strength in the injured leg. Patients with tears of the ACL in their left knee had a significantly longer downhill running time (left bend) than those with a similar injury in their right knee ($p<0.05$). Patients with PCL injuries showed a tendency to have a higher quotient between the running time up- and down-hill compared to patients with ACL tears ($p=0.067$). Functional tests correlated to the functional score ($r=0.45$–0.60).

Our functional test seems to be valuable as a complement to other methods in the follow-up of patients with knee injuries. The most useful items seem to be the one-leg jump test and figure-of-eight running, as these items seem to evaluate specifically the function of the injured leg. Possibly running up-hill is of specific interest in patients with PCL tears.

Early repair of the torn anterior cruciate ligament – a long-term follow-up study

Magnus Odensten, Jack Lysholm & Jan Gillquist

Sport Trauma Research Group, Department of Orthopaedic Surgery, University of Linköping, Sweden

In his thesis, Ivar Palmer in 1938 advocated primary suture of the torn anterior cruciate ligament as early as possible after the injury. Dr Palmer formulated a "therapeutic philosophy" for knee ligament injuries, used in many parts of the world through the years. Studies with contradictory conclusions by Feagin (1976) and Balkfors (1982) have been hampered by a high frequency of isolated tears of the anterior cruciate ligament, indicating insufficient diagnosis of associated ligament tears.

Out of 51 consecutive patients with total substance tears of the anterior cruciate ligament, 44 (86 per cent) were followed. One died in intercurrent disease and six were lost to follow-up. None had an isolated tear of the anterior cruciate; 41 (93 per cent) had an associated tear of the medial ligament complex and one of the lateral ligaments. Two had no associated ligament injury but also had a torn meniscus. The most common cause of injury was sport. A primary suture of the torn anterior cruciate ligament, using the technique of Palmer (1938), was done as early as possible after the injury. Thirty-six were operated on within 1 week (82 per cent), and the rest within 2 weeks. Associated ligament tears were repaired anatomically, and menisci were either re-attached in peripheral tears or excised. The patients were followed until a minimum follow-up of 4 years was obtained. The follow-up consisted of an evaluation of knee function using Lysholm's scoring scale (Lysholm & Gillquist 1982) and clinical examination of the joint.

The results seemed to deteriorate with time. Before 4 years after the injury, all but one patient showed excellent or good knee function (score over 82 points). After that time, half of the patients scored excellent/good and half fair/poor. Only four patients (10 per cent) showed a completely stable knee at the late follow-up.

It is concluded that primary suture of the anterior cruciate ligament, although giving a promising primary result, does not lead to a stable knee in the long run. The gradually increasing instability is likely to be due to successive stretching of secondary stabilizing capsular ligaments.

Is transfer of pes anserinus indicated in the treatment of chronic anterior cruciate lesions?

Gunnar Westerlind, Bertil Berggren, Lennart Hovelius & Stefan Rosfors

Department of Orthopaedic Surgery, Gävle Hospital, Gävle, Sweden

During the years 1974–1978, 43 consecutive patients with chronic injury of the anterior cruciate ligament had a pesoplasty according to Slocum-Larson (1968) performed at the orthopaedic department, Gävle Hospital. Twenty patients had a reefing of the posteromedial capsulae added to the pesoplasty and in 30 cases meniscectomy (four bilateral) was simultaneously performed.

The follow-up was performed 4–8 years after the pesoplasty and during this time 14 patients had undergone further surgery (33 per cent) (lateral retinacular release one case, meniscectomy three cases, extra- or intraarticular surgery to improve stability ten cases, and five of the latter also had simultaneous meniscectomy performed).

At follow-up, 30 out of 33 patients who had not undergone further stabilizing surgery considered the

result to be good or excellent, even if 88 per cent of these had a positive pivot shift. X-ray examination showed reduced medial joint space in 16 out of 36 cases.

Conclusion: This study stresses the importance of a posteromedial exploration for visualization of the whole medial meniscus as well as an examination of the lateral meniscus when treating the anterior cruciate deficient knee. The study shows that remaining antero-lateral instability (positive pivot shift) does not exclude a subjectively well-functioning knee.

Cruciate surgery using the meniscus

Bertil Berggren, Lennart Hovelius & Gunnar Westerlind

Department of Orthopaedic Surgery, Gävle Hospital, Gävle, Sweden

During the years 1974–1981, we used an injured meniscus alone or as a reinforcement when treating ruptures of the anterior or posterior cruciate ligament in 29 patients. One patient had bilateral surgery and one was lost to follow-up, so that the study includes 29 operated knees.

In five cases (2 ACL, 1 PCL and 2 ACL + PCL) the injury was acute (less than 4 weeks old) and the meniscus was then used to reinforce the ruptured cruciate. In the majority of the chronic cases (all ACL), the meniscus reinforced a transplant, usually fascia lata or the semitendinosus tendon.

A follow-up was performed 15 months – 9 years after surgery. Twenty-five cases were followed for 2 years or more. The clinical follow-up also included an X-ray examination. Except for one patient (medial meniscectomy), no further surgery had been performed during the follow-up period. Nineteen of 24 knees with chronic ACL injury had no pivot shift and those with posterior cruciate ruptures had hardly visible posterior sag at follow-up.

We conclude that an injured meniscus not suitable for resuture may well be used as reinforcement of a transplant or an injured ligament to get better "cruciate bulk". This also saves, for example, the patellar tendon for later repairs if necessary. The postoperative rehabilitation has not differed compared to other types of cruciate surgery.

Arthroscopic examination of the patello-femoral joint

Ulf Lindberg, Per Hamberg, Jack Lysholm & Jan Gillquist

Department of Orthopaedic Surgery, University of Linköping, Linköping, Sweden

In patients with patello-femoral disorders there is a need for supplementary diagnostic techniques: (1) It is important to reserve the diagnosis chondromalacia patellae for patients in whom the cartilage injury has been proven (DeHaven 1980); (2) A malalignment of the patello-femoral articulation is often found (Ficat 1977); (3) It is important to exclude other internal derangements of the joint. The object of this paper is to describe a technique for examination of the patello-femoral joint during arthroscopy.

Arthroscopy is done according to Gillquist et al. (1976). To examine the patello-femoral articulation, a 70° telescope is used. The telescope is rotated upwards with the tip of the scope close to the border between the intercondylar notch and the femoral groove. With adequate distension of the joint, a good overview of the patello-femoral joint is obtained. The knee can be moved through its full range of motion, and the alignment between the patella and the femur can be studied. For a detailed examination of the cartilage of the patella, the 30° telescope can be used. It is placed in the patello-femoral joint, and the joint surfaces can then be thoroughly examined by sliding the scope in and out through the joint. The cartilage can also be palpated with a probe inserted through a separate stab wound.

To study the effect of varying intraarticular pressures on patellar tracking, serial photographs were taken in six patients. Intraarticular pressure was varied between 300 and 0 mm Hg by closing the outflow cannula while the inflow pump was kept at constant speed. Pressure was measured with a pressure transducer inserted into the suprapatellar pouch. Photographs were taken in 90, 30 and 0 degrees of flexion at high or low pressure (200–300 mm Hg and 50–80 mm Hg, respectively). The normal working pressure was found to be around 100 mm Hg, but occasionally the pressure had to be elevated to 250 mm Hg to get a good view of the femuropatellar joint. The pictures showed that the patella changed position in a symmetrical fashion. A normal patella was always centered, irrespective of the pressure inside the joint. A subluxed patella remained subluxed at both low and high pressures. If the patella was subluxed at 30° flexion, it was always reduced to a congruent position at an increased angle of flexion. It was shown that subluxation was best judged by determining the position of the mid-patellar ridge in relation to the

deepest part of the femoral groove. In subluxation the midpatellar ridge is always dislocated laterally. The so-called patellar overhang on the lateral side of the femur is an unreliable sign of subluxation since the patella can be moved sideways with the arthroscope.

It is concluded that arthroscopy with the anterior mid-line approach and a 70° telescope admits careful examination of the patello-femoral joint. The sometimes high pressure necessary to admit full visualization of the joint does not jeopardize the findings.

Krogius tenoplasty for recurrent dislocation of the patella

F. C. H. Bauer, Torsten Wredmark & Bengt Isberg

Departments of Orthopaedic Surgery and Radiology, Huddinge Hospital, Huddinge, Sweden

The primary surgical treatment in our department for recurrent dislocation of the patella has been the Krogius tenoplasty. Thirty-five patients were treated during the years 1975–1982, and 31 of these were available for follow up. Almost half of the patients had bilateral disease but only one underwent bilateral surgery; thus 32 knees were investigated. The patients underwent clinical examination, bilateral isokinetic quadriceps muscle strength evaluation and radiological examination under standardized conditions.

The mean follow-up from the last operation was 34 (range 5–84) months. The tendency to dislocation or subluxation had recurred in 15/32 knees, and eight of these have been reoperated either by another Krogius procedure or by medialization of the tibial tubercle. At follow-up, 12/32 knees had had dislocations or subluxated, including five of the eight knees that had undergone more than one procedure. During or after exercise 9/32 knees were painful, but the pain was in most cases slight and no patient had severe disability. Dysesthesia over the infrapatellar area causing discomfort on kneeling, occurred in 19/31 patients. Possible reasons for failure will be discussed in the light of etiologic parameters.

The correlation between patello-femoral joint pathology and the patellalgia syndrome

Ulf Lindberg, Jack Lysholm & Jan Gillquist

Department of Orthopaedic Surgery, University of Linköping, Linköping, Sweden

A poor correlation between intra-articular pathologic findings and patello-femoral pain, the so-called patello-femoral arthralgia syndrome (PFA), has been reported (DeHaven 1980). This alleged lack of correlation has often been poorly supported, but nonetheless with nothing said about the intra-articular pathology, PFA has been given as the indication for different surgical procedures (Bandi & Brennwall 1974, Insall et al. 1979). The results of surgical reconstruction of the patello-femoral joint are often discouraging, possibly indicating that a more specified diagnosis would be of value (DeHaven 1979).

For analysis of different types of intra-articular patello-femoral joint pathology and its correlation to the patello-femoral arthralgia (PFA) syndrome, all patients with patello-femoral joint pathology on arthroscopy were selected from a consecutive series of 1156 arthroscopies in 1078 patients (702 men and 376 women); 175 patients (88 men and 87 women) filled the criteria of patello-femoral joint pathology and were included in the study. All data concerning the arthroscopic findings were continually computerized, and details concerning the case history, especially the presence or absence of PFA, and clinical findings were collected retrospectively from the patients' records. Three different types of patello-femoral pathology were identified. Fifty-three patients showed chondromalacia of the patella, with no signs of patella subluxation. This was seldom an isolated injury, but was frequently associated with a generalized osteoarthrosis or meniscus lesions. In these patients symptoms other than PFA predominated. Forty-two patients showed a subluxation of the patella without chondromalacia. This was also rarely an isolated finding, although infrequently associated with osteoarthrosis. The most common associated pathology was ligament and meniscus tears. Also in this group symptoms other than PFA were the common complaint. Forty-seven patients showed subluxation of the patella in combination with chondromalacia. This was commonly a single pathologic finding, and it was frequently associated with complaints of PFA. In this group, in patients with a longer case history, the chondromalacia was more pronounced and was observed in all parts of the patella. In patients with a short history (less than 1 year), the chondromalacia was mostly limited to superficial fibrillation or soft areas in the cartilage, and was predominantly located in the central and lateral parts of the patella.

The effects of a patella brace on the performance in a knee extension strength test (Cybex-2) in patients with patellar pain

Jack Lysholm, Jan Ekstrand, Ulf Lindberg, Marketta Nordin & Jan Gillquist

Department of Orthopaedic Surgery, Regionsjukhuset, Linköping, Sweden

In isokinetic muscle strength measurements (Cybex-2), a constant movement velocity (angle velocity) is used, but the torque is variable through the range of movement. In patients with patello-femoral arthralgia disorder (PFA), a painful sector of the range of movement is often found. This can be illustrated in the Cybex-2 test as a sector of "loss of strength" due to pain inhibition of the muscle. This sector is usually localized at the peak of the curve (Ficat 1977). The object of this study was to analyze the quadriceps muscle peak strength with the Cybex-2 technique in patients with PFA with and without a patella brace.

Twenty-four patients, (18 women and 6 men) were studied. All had PFA. The diagnosis was made on typical clinical findings, but in six patients with pain, also over the medial joint line, it was supplemented with arthroscopy. After a 1-month adaptation period without the brace (LIC, Linköping), a Cybex-2 test of the symptomatic leg was done both with and without the brace. The symptom-free leg was tested as a control. The mean peak torque at 30°/s was 138±49.3 Nm in the diseased leg compared to 167.0±56.8 Nm in the control leg. With the brace the peak torque increased 35.7±54.5 Nm ($p<0.002$). In the strength test in the control leg 88 per cent improved their performance compared to six (25 per cent) without the brace ($p<0.02$). Patients under the age of 30 years had a better effect than patients over that age ($p<0.05$). No statistical difference was found comparing the effect of the brace in patients with only PFA to patients with PFA in combination with a feeling of patellar instability.

It is concluded that the reduced quadriceps muscle strength often observed in patients with PFA is at least partly due to pain inhibition of the muscle rather than actual muscle atrophy. This is illustrated by the immediate movement of the Cybex-2-test when a brace was used. The results support the use of a patella brace in the conservative management of patients with PFA. In long-standing conditions (older patients), the effect is less good.

Chondromalacia patellae in adolescence – myth or reality?

Olof Renberg

Department of Orthopaedic Surgery, Norrköping, Sweden

Among 482 arthroscopies performed in 1981–1982, the incidence and the grade of C. P. was registered. A linear correlation to the age of the patients was also registered. No C. P. was found in the age group 0–15 (n=23), while in the age groups over 50 there was about 50 per cent incidence. In the age group 16–25 (n=122), seven patients were found to have C. P. which in five could be explained to be caused by a biomechanical disturbance of the knee (instability or a meniscus lesion). Two patients suffered from osteochondritis patellae. Only one of these patients with C. P. complained about anterior pain of the knee.

Among patients without C. P. anterior pains were common. Male patients' anterior pains were always explained to be an intraarticular disease. Female patients' anterior pains, however, seem to be due to hypermobile knees.

It is rare for young people to suffer from chondromalacia patellae, but when it happens it is due either to a biomechanical disturbance or to osteochondritis patellae.

Division of carpal ligament vs internal neurolysis for carpal tunnel syndrome

J. Thorling, H. Holmgren-Larsson, W. Leszniewski, U. Lindén & L. Rabow

Departments of Orthopaedic Surgery, Neurosurgery and Neurophysiology, University Hospital, Linköping, Sweden

Forty-eight consecutive patients referred to the orthopaedic and neurosurgical departments with clinical and neurophysiological diagnosis of carpal tunnel syndrome (CTS) were randomised and operated on with simple division of the carpal ligament or with this procedure combined with internal neurolysis and a microsurgical technique. A thorough clinical examination and neurophysiological study, consisting of sensory and motor conduction velocity with distal latency, EMG, vibration perception threshold and biophysiometry was carried out before operation, and 1 month and 6 months after operation. The overall results did not show any significant difference between the two groups of patients, regarding either clinical or neurophysiological parameters. Eighty-nine per cent of the patients in both groups

considered themselves totally free of symptoms after 6 months and all patients were subjectively and objectively improved. This study was proposed to investigate if internal neurolysis should be the method of choice for operation of CTS. The fact that most patients became free of symptoms also after simple division of the ligament indicates, however, that the more complicated procedure of internal neurolysis is perhaps necessary only in selected cases.

Prophylactic, operative fixation of bone metastases

Leif Stenke, Göran Josefsson, Bo Lundberg & Torsten Norin

Departments of Orthopaedic Surgery and Oncology, Gävle Hospital, Gävle, Sweden

During 1971–1980, 26 operations were performed at the Orthopaedic Clinic in Gävle Hospital on patients with severe, advanced cancer with painful bone metastases but without pathological fracture. The operating sites were mainly the femur (19) and the humerus (5) bones and the methods used consisted of the Künscher (20), the Ender (5) and the Rushpin (1) techniques.

The fixation procedures resulted in a significant reduction of pain in most patients and adequate postoperative stability. Although most of the patients were old (mean 67, range 41–78 years), there was a low frequency of postoperative complications. Pain was reduced in 22/26 cases; in 10 of these, the operations were directly combined with local radiation therapy of the bone metastases.

The overall survival of these patients was poor (mean 14 months, range 6 days – 47 months) but the fixating operations were not shown to affect the survival duration negatively. Instead, it appears that these orthopaedic interventions may help to remove pain, prevent fractures, speed rehabilitation and thus add "life" to the remaining days or years of these severely ill patients.