Danish Orthopedic Society

Århus, May 2–3, 1997

Editor: Erik Tøndevold
Dept. of Orthopedic Surgery
Rigshospitalet
Blegdamsvej 9
DK-2100 Copenhagen, Denmark

SHOULDER/ELBOW

Total shoulder replacement for the treatment of gleno-humeral osteoarthritis

L H Frich, H Knudsen, H V Johansen, J O Søjbjerg and O Sneppen

Shoulder and Elbow Clinic, Orthopedic Dept. E, University Hospital of Aarhus, Denmark

Our purpose was to determine the outcome of 38 total shoulder replacements (TSR) performed between 1983 and 1994 for the treatment of primary and secondary osteoarthritis (OA). All shoulders presented severe pain and disability preoperatively. However, only 28 shoulders, all with more than 3 year's follow-up (mean 7.1 yrs) are reviewed. The results are based on the Constant Score (CS) from 0–100 points.

Patients and results: Primary OA: 8 patients (10 shoulders) with primary OA of the glenohumeral joint underwent TSR. Mean age at the time of evaluation was 80 (71–87) years. Pain and function improved significantly in the majority of the patients with a mean CS of 57 (12–68). In follow-up, 2 well functioning patients (initial CS score 88) developed late rotator cuff defects and there were 2 reoperations due to mechanical loosening of the glenoid prosthesis.

Secondary OA: 17 patients (18 shoulders) with secondary OA were followed for average 6 (3–13) years. The mean age at the time of evaluation was 69 (47–90) years.

6 patients (6 shoulders) with a primary diagnosis of (non-operated) instability were treated with a TSR (5) and a hemiarthroplasty (1). 2 shoulders had glenoid bone grafting. CS was low (21–30) in 3 shoulders due to persistent instability. Mean CS was 52 (21–80).

4 patients (5 shoulders) with necrosis of the proximal humerus (AVN) underwent TSR (4) and hemiarthroplasty (1). Etiology was steroid in 4 shoulders and radiation therapy in 1 shoulder. One patient, suffering from LED had a bilateral TSR with a poor outcome. Mean CS was 55 (17–84). 6 patients (6 shoulders) were treated for large rotator cuff tears or cuff arthropaty with a TSR (2) and a hemiarthroplasty (4). Mean CS was 54 (29–82).

Discussion: TSR in primary OA is a well established and safe procedure. However, we found deteriorating results related to late rotatorcuff failure in 40% of the primary OA cases. Late rotator cuff rupture might be related to a continuing age related soft tissue degenerative process unrelated to OA. Prosthetic replacement in shoulders with secondary OA due to instability is a technically demanding procedure. AVN of the proximal humorus treated with TSR gives predictably good results in patients with a non-systemic disease. Hemiarthroplasty with an oversize-head is preferable in cases with large rotatorcuff defects.

Results of cemented hemiarthroplasty with the Global shoulder

K Gringer, C Munk Jensen, K Bak and C Tørholm

Dept. of Orthopedics, Gentofte Hospital, Denmark

The purpose of this study is to report the first results of cemented hemiarthroplasty using the Global prosthesis.

Patients and methods: Between 1993 and 1996, 30 consecutive patients with 31 shoulders were operated on. At follow-up, 4 had died and 4 patients would not participate, leaving 22 patients with 22 hemiarthoplasties. The patients were evaluated after median 24 (9–41) months using the Constant score. Isometric abduction torque was measured with the Isobex 2.1. There were 16 women and 6 men, median age 68 (34–82) years. The indications were fracture of the proximal humeral head or neck with at least 3 fragments in 18 patients, OA in 2, RA in 1, and necrosis of the humeral head in 1. Ten were operated on the dominant arm and 12 on the non-dominant arm. Patients with fractures were operated median 33 (1–2920) days after injury. Four patients had previous osteosynthesis. One third underwent shoulder arthroplasty within the first week after injury.

Results: The pain score using a VAS scale from 0 (severe) to 15 (none) was median 10. 55% had no or mild pain. There were no sleep disturbances in 21. All patients could reach their hand to neck or higher. The median forward elevation was 45 (20–110) degrees. The median abduction was 55 (35– 110) degrees. External rotation from neutral was median 15 (0–45) degrees. Internal rotation with the back of the hand reached the level between 3rd lumbar and the 12th dorsal vertebra. The mean abduction torque in 17 patients was 4.3 kg on the healthy side compared to mean 2.2 kg on the

operated shoulder. The abduction torque ratio was 0.51. The overall Constant score was median 38 (35–69) on the operated shoulder compared to median 81 (35–93) on the contralateral shoulder (ratio 0.62). Seventeen patients would undergo the same operation if needed. One had deep infection.

Conclusion: According to the preoperative goals: ability to reach the waist, neck and mouth and good pain relief, the results after cemented hemiarthroplasty using the Global shoulder system are satisfactory.

Posterior superior glenoid impingement

H V Johannsen, J Lind Krarup and J O Søjbjerg

Shoulder and Elbow Clinic, Department of Orthopedic Surgery, Århus University Hospital

Posterior superior glenoid impingement is a recently recognized mechanism of injury producing partial rotator cuff lesions and posterior superior labral tears in throwing athletes and swimmers.

The aim of this study was to evaluate the results of our treatment regimen for patients with arthroscopically verified posterior superior impingement. Patients with concomitant lesions to the inferior glenohumeral ligament are not included.

Material and methods: From March 1994 through September 1996, 20 patients were treated; 16 were active throwing athletes (predominantly handball), 2 were high level swimmers and 2 were former overhead throwing athletes. 4 patients reported a traumatic onset. Indications for surgery were shoulder pain at throwing (or swimming) and a failed attempt at conservative treatment. Median age was 26 (18–41) years. There were 13 men and 7 women. Median duration of symptoms was 22 (9–84) months.

Following diagnostic arthroscopy—excluding anterior inferior ligament lesions and other significant intraarticular pathology—the partial rotator cuff lesions and posterior superior labral tears were debrided arthroscopically. During postoperative rehabilitation emphasis was placed on strengthening rotator cuff muscles, restoring normal scapulohumeral rhythm and avoiding stretching of anterior static glenohumeral stabilizers.

Results: 1 patient was lost to follow-up. 11 of 16 throwing athletes and the 2 swimmers were able to return to pre-injury activity level without shoulder symptoms. 1 patient retired from competitive sports for reasons unrelated to her shoulder problem and had a well functioning pain free shoulder at follow-up. 3 patients had an unsatisfactory result and were not able to return to overhead sports at pre-injury level. The 2 former throwing athletes had a satisfactory result and at follow-up both were active on a recreational level. Overall satisfaction rate: 84%. Average time for return to sports participation was 8 (4–12) months.

Conclusion: In patients with symptomatic posterior superior impingement, resistant to non-operative treatment, arthroscopic debridement followed by careful physiotherapist guided rehabilitation is an effective treatment for the majority of patients.

Rehabilitation after rotator cuff reconstruction—a 12 months follow-up study

H Knudsen, B Olsen, HV Johannsen and J O Søjbjerg

Shoulder and Elbow Clinic, Department of Orthopedic Surgery, University Hospital of Aarhus

Reconstruction of rotator cuff (RC) defects with transposition or direct suture are well-proven techniques, with high rates of successful results. The aim of this prospective study was to evaluate the functional outcome after RC reconstruction over a short term follow-up period.

Material and methods: 18 RC reconstructions (18 patients) were performed between August 1995 and March 1996. All patients (4 women, 14 men), with an average age of 54 years (29–77), were available for clinical assessment with Constant score approximately 6 months postoperatively. One patient was excluded following a traumatic retear. The remaining 17 patients were reevaluated 12 months postoperatively. During surgery direct tendon-to-bone fixation was applied in 11 cases, the remaining 6 reconstructions included transposition.

Results: Preoperative average Constant score was 42 (18–67) points. After 6 and 12 months the average overall scores were 62 (23–98) and 66 (17–98) points, respectively, which were significant improvements. A comparison between the 6-month and 12-month scores shows no significant difference. 9 patients achieved an excellent result, 4 achieved a good functional result, 2 achieved a moderate result, and 2 patients had a poor functional outcome (Constant's Disability Quantification). There was no significant difference regarding functional outcome between patients with direct suture and patients with transposition.

Conclusion: The present result suggests that the functional outcome after RC reconstruction is stationary after six months. This is in contrast to other studies that find stationary functional results after 1 year .

Percutaneous pinning of displaced proximal humeral fractures

K Nicolajsen, J Frøkjær, J Schultz Hansen, L Østergård and P E Jensen

Depts. of Orthopedics and Radiology, Odense University Hospital

To minimize the risk of surgical trauma, we use multiple percutaneous pinning to stabilize displaced proximal fractures of the humerus. We present our results from a 5-year period.

Material and methods: From Jan. 1990 to Dec. 1995, 60 consecutive patients were operated on. During the first year, 4-part fractures were not routinely treated with shoulder prosthesis. At follow-up 10 had died, 4 were living in another county, 5 patients were unable to attend. 37 patients were examined and 4 patients were contacted by telephone for follow-up. 6 children with epiphysiolyses with median age 12 (10–14) years and 35 adults with median age 66 (18–87)

years were included. Median follow-up time was 36 (10–89) months. 19 patients had a 2-part fracture, 19 a 3-part fracture and 3 a 4-part fracture. One fracture was fixed with 1 pin, 18 fractures with 2 pins, 16 fractures with 3 pins and 6 fractures with 4 pins. In 35 cases we used threaded pins, and in 6 cases unthreaded pins. Pins were removed median 5 (2–19) weeks postoperatively.

Results: Overall 10 patients were reoperated. 27 patients had pin migration, which in 6 cases resulted in loss of fixation and reoperation. 3 patients became infected, one of these had a deep infection, and was reoperated. 3 patients developed a pseudarthrosis, 1 was reoperated, the other 2 did not want operation because of age and weak health. 2 patients had a fracture in their shoulder shortly after pin removal, 4 weeks postoperatively. Both were reoperated. Avascular necrosis of the humeral head was not diagnosed in any cases. Constant score at follow-up was in 2-part fractures median 61 (6–100) and in 3-part fractures median 69 (26–100). All 4-part fractures were failures, and were reoperated.

Conclusion: This technique was described by Jakob, and the first to present results was Jaberg et al. (ref), who in a series of 48 patients found excellent results in 70%, and no cases of fixation failure. We found a high incidence of pin migration, resulting in 6 failures. 9 patients had a Constant score of more than 80 at follow-up. This illustrates that even though the surgical technique is simple, it is surgically demanding. We conclude, that in this series, the incidence of fixation failure is unacceptably high. However, in selected patients with a 2- or 3-part proximal humeral fracture this technique may be promising, if threaded pins are placed in a subchondral level and in a sufficient number.

Reference: Jaberg H, Warner JJP and Jakob RP. Percutaneous stabilization of unstable fractures of the humerus. J Bone Joint Surg 1992; 74-A: 508-515.

The prognostic value of the Baker classification of recurrence after traumatic primary anterior shoulder dislocation in conservatively treated patients

P Suder and B Wulff Jakobsen

Danish Society for Shoulder and Elbow Surgery and Dept. of Orthopedic Surgery, University Hospital of Aarhus

Arthroscopic classification of the intraarticular lesions after traumatic primary anterior shoulder dislocation (TPASD) is important in order to identify the pathology responsible for the high rate of recurrence in young patients (1). The purpose of the present study is to evaluate the prognostic value of the Baker classification (2) regarding recurrence after TPASD in conservatively treated patients.

Patients and methods: 39 patients between 15–39 years were arthroscoped within 10 days after a radiographically confirmed TPASD and randomized to conservative treatment. The capsulolabral lesions were classified as capsular tear without labral tear (Baker 1), capsular lesion with partial labral detachment (Baker 2) and capsular tear with complete labral detachment (Baker 3). Postoperatively all patients were immobilized and received standard rehabilitation. The patients were clinically examined at 6, 12 and 24 months and any recurrences after 36, 48 and 60 months were recorded. Used statistics test was Kaplan Meier Survival Test and Log Rank test with a level of significance $p < 0.05$.

Results: In the recurrence group average age was 21 (16–29) years with a male/female ratio 19/4. 20 patients had a Baker 3 lesion, 3 a Baker 2 and none had a Baker 1 lesion. After 60 months 23 had experienced recurrence (1–12) where 74% of the first recurrent dislocations occurred within 24 months. There was no statistical correlation between the time of first and the no. of recurrences and type of Baker pathology. In the non-recurrence group average age was 23 (16–32) years with a male/female ratio 13/3. 13 had a Baker 3 lesion, 2 a Baker 2 and 1 a Baker 1 lesion. After 60 months 50% of the patients had severe shoulder symptoms. Using the Kaplan Meier Plot and a Log Rank test with the end point "time to first recurrence" none of the different Baker lesions were associated with increased risk of recurrence ($p = 0.64$).

Conclusion: The Baker classification used to classify the intraarticular pathology after TPASD is unable to identify the patients at risk of recurrence.

References

1. Hovelius L et al. Anterior dislocation of the shoulder in teenagers and young adults. J Bone Joint Surg 1987; 69A:393-9.
2. Baker CL et al. Arthroscopic evaluation of acute initial anterior shoulder dislocations. Am J Sports Med 1990; 18 (1): 25-8.

Chronic dislocation of the acromioclavicular joint treated by excision of distal clavicle and transfer of the coracoacromial ligament

U Bromose, B Sanderhoff Olsen and J O Søjbjerg

Shoulder and Elbow Clinic, Orthopedic Dept. E, Aarhus University Hospital, Nørrebrogade, 8000 Aarhus C, Denmark

The aim of this study is to evaluate the long-term postoperative outcome of chronic symptomatic dislocation of the acromioclavicular (AC) joint treated by excision of the distal clavicle and transfer of the coracoacromial ligament.

Material and methods: 19 patients with a type III injury to the AC joint and secondary chronical pain were operated on and followed prospectively. Average time from dislocation to operation was 31 (7–192) months. Follow-up time before postoperative assessment was averagely 37 (10–56) months.

The distal 2 cm of the clavicle were excised and the lateral end reamed by drilling. The coracoacromial ligament was osteomized from acromion with a bone fragment, inserted in the lateral clavicle and fixed by sutures through drill holes. Finally a screw reduced the clavicle to normal position by attachment to the coracoid. The screw was removed after 6 weeks.

All patients were assessed postoperatively and 11 patients preoperatively by Constant functional scoring (100 points scale).

Results: The mean preoperative score for the affected shoulder was 71 (36–88) compared with a mean postoperative score of 86 (64–98), showing a significant functional improvement due to the operation ($p<0.03$, t-test).

Postoperative outcome was rated by difference in bilateral scoring (D in Constant score = nonoperated – operated). 14 patients presented excellent ($D < 10$ points), 4 good ($10 < D < 20$) and 1 poor results ($D > 20$).

14 patients gained full range of motion, while 10 patients gained equal bilateral strength and positioning.

Conclusion: The operative technique described is a possible solution for patients with chronic pain secondary to complete acromioclavicular dislocation. A full range of pain free motion is regained for the majority of patients, while complete strength is a less certain outcome.

Early results after total elbow arthroplasty

C Munk Jensen, B Kristiansen, R Pilegård, B Gynning, K. Hviid and C Tørholm.

Orthopedic Department, KAS Gentofte and FAC Frederiksund

Since 1988 we have performed total elbow arthroplasty (TEA) in severely destructed elbows mainly due to rheumatoid arthritis. The purpose of this study was to report our very early results after TEA.

Material and methods: A total of 21 patients was operated on between 1988 and 1996 with TEA. Two patients had bilateral procedures. Sex-ratio was 17 women and 4 men. Mean age at time of operation was 59 (27–83) years.

The indications were in 18 cases RA, in 3 cases OA and in 2 cases sequelae after fracture.

Four different prothesis designs were implanted, (13 Capitello-Condylar, 6 Souter, 3 Osteonic, 1 Ruper-Tuke).

Median follow-up was 21 (6–65) months. Evaluation preoperatively and at follow-up included the Hospital for Special Surgery elbow score and radiography.

Results: Preoperative score was median 14 (0–37) and score at follow-up was increased to median 80 (33-100). 16 cases was rated as exellent and good, 2 as fair and 2 as poor, while 3 cases with a score below 60 were rated as failures. Patient satisfaction at follow-up was noted in 19/21 cases.

Range of motion in extension/flexion was increased from preoperative 32/92 to 28/123 at follow-up and supination/pronation from 34/47 to 66/9 degrees.

Complications requiring reoperation were noted in 4 cases, 3 due to luxation and one case sustained a deep infection. In 3/6 cases of the Souter elbow, radiography showed signs of loosening of the humeral component. Minor complications as affection of the ulnar nerve was seen in 7 cases, two with persistent sensorial affection.

Conclusion: TEA provides predictable results regarding pain relief and improved function, especially in RA.

A long learning curve should be expected and careful preoperative evaluation is important. Humeral implants without stem are not recommended.

Arthroscopic release of the stiff elbow

H V Johannsen and B Sanderhoff Olsen

Shoulder and Elbow Clinic, Department of Orthopedic Surgery, Århus University Hospital

The aim of this study was to evaluate the results after arthroscopic release for moderate elbow joint contractures.

Material and methods: From January 1994 through December 1996, 19 patients were operated on for posttraumatic elbow stiffness using an arthroscopic technique. Indications for surgery were; pain and restriction of range of motion in the absence of significant intrinsic pathology. Median age was 35 (15–60) years. There were 18 men and 1 woman. Median duration of symptoms was 3 (1–12) years. 16 were treated as outpatients.

All patients had extension deficits; median 30° (15°–40°), 11 also had flexion deficits; median 120° (105°–125°).

Surgery in all cases included debridement of the anterior and posterior compartments with clearing of the olecranon fossa and in most cases also complete division of the anterior capsule. If prominent, the coronoid process or the tip of the olecranon was resected.

Range of motion exercises were started on the second postoperative day.

Results: At an average follow-up of 4 (2–6) months the median extension deficit had decreased to 10° (–10° to 20°), and only 2 patients had minor flexion deficits (<10°). In terms of pain relief and improvement in range of motion 16 of 19 patients were satisfied with the results. 2 patients had an unsatisfactory pain relief from the procedure and 1 only a minor improvement in range of motion. There were no neurovascular complications.

Conclusion: Arthroscopic release for posttraumatic elbow stiffness is an effective procedure for the majority of patients with moderate joint contractures. The postoperative morbidity is low.

Reconstruction for recurrent elbow instability

B Sanderhoff Olsen and J O Søjbjerg

Shoulder and Elbow clinic, Orthopedic dept. E, Arabs Univ. Hospital, Nørrebrogade, 8000 Århus C

Posterolateral elbow instability (PI) is related to deficiency of the lateral collateral ligament (LCL) and gives recurrent dislocations or radial head subluxations. Recently a reconstruction aimed at correcting PI was introduced at our department. The aim of this study was to report the surgical technique and the postoperative results among the first 20 operated on patients.

Patients and methods: 20 consecutive patients were treated for PI. Minimum time from trauma to surgery was 3 months. The postoperative median follow-up time was 23 (6–51) months. 16 patients had previously sustained a traumatic elbow dislocation. 7 patients were previously operated on, 2 for lateral epicondylitis, 3 for radial head fractures, 1 for instability to valgus stress and 1 for osteochondritis. The patients were evaluated pre- and postoperatively with elbow radiography, clinical examination of movement and instability, and finally a pivot shift stress test was performed. All operated elbows presented lateral pain prior to surgery, a sensation of instability and either objective instability or apprehension during testing. All patients were treated with a reconstruction of the LCL, reestablising the constraint between the ulna and the radial epicondyle using a tricepsgraft and Mitek anchors. Postoperatively the elbows were immobilized for 6 weeks, followed by 6 weeks of unloaded movement in a Don-Joy bandage. Contact sports were allowed after 6 months.

Results: The operative procedure is presented stepwise. Following surgery 17 operated elbows were objectively stable. 14 patients had no subjective symptoms following the operation. Furthermore 3 reported significant improvement. Only 3 had no subjective improvement. 16 patients were satisfied with the operative outcome and had returned to their pretraumatic activity level. 5 had inferior results defined as recurrence of pain, instability and/or inability to return to prior activity level. All patients with persistent PI were represented in this group. All 5 patients with inferior results were operated on prior to surgery with different procedures affecting the ligaments, and involving chronic elbow pain.

Conclusion: The present operative technique represents a good method for reestablishing the stability of the posterolateral unstable elbow joint. Our experience with these first 20 operated patients demonstrates the necessity for proper preoperative evaluation, and indicates that a strict indication for surgery is needed. Furthermore, based on this study and a follow-up study on elbow dislocations, we think that this condition is more frequent than previously reported.

Elbow joint kinematics following excision of the radial head

S L Jensen, B S Olsen, J O Søjbjerg.

Biomechanics Laboratory, University Hospital of Aarhus, Denmark.

The treatment of comminuted fractures of the radial head is controversial. Simple excision as well as open reduction and internal fixation has been recommended. Knowledge of the contribution of the radial head to elbow joint stability is mandatory to the establishment of the best mode of treatment. The objective of this study was to describe the kinematic changes in the elbow joint following radial head excision.

Material and methods: 7 osteoligamentous intact elbow preparations were included. Each elbow specimen was tested during a continuous movement through the flexion arc in a kinematic stress apparatus. A paired t-test was applied to the results obtained before and after excision of the radial head.

Results: During unloaded movement, radial head excision induced a maximum varus displacement of 1.6° at 20° of joint flexion and a maximum external rotation of 3.2° at 110° of flexion. When applying a load of 0.75 Nm, radial head excision induced a maximum laxity of 3.3° at 20° of flexion in forced varus and a maximum laxity of 8.9° at 10° of flexion in forced external rotation. No significant laxity was observed in forced valgus or internal rotation. The results were independent of the rotation of the forearm.

Conclusion: This study suggests that the radial head acts as a stabilizer to the elbow joint in forced varus and forced external rotation. The results indicate that comminuted fractures of the radial head cannot be treated by excision without altering the basic kinematics and stability of the elbow joint. Follow-up studies are needed to determine the clinical relevance of the results.

HAND SURGERY

Carpal tunnel release, a comparison of 3 methods—a preliminary report

A Ibsen Sørensen, M Boeckstyns, N Søe Nielsen, M Haugegård

Gentofte Hospital/University of Copenhagen, section of hand surgery

The purpose of the study was to evaluate 3 methods of surgical carpal tunnel release: traditional open release (incision crossing the wrist joint), open release through a small incision just distal to the distal flexion crease of the wrist, and endoscopic release with the Concept CTS Relief Kit. The present analysis represents a midway evaluation of the trial.

Material and methods: Prospective, randomized, blinded design. All cases were verified with EMG and conduction velocity measurement. Polyneuropathy, rheumatoid arthritis and posttraumatic cases were excluded. Only one hand was included per patient. End-point variables were pain (VAS), paraesthesia (VAS), grip strength (% of contralateral), wrist motion (% of contralateral), pillar pain (present or not), and sick-leave. Evaluation was preoperative and at 1, 2, 3, 6, 12 and 24 weeks postoperatively. Planned number of patients was 30 in each treatment group.

Results: To this date, 48 patients have completed the follow-up period. There was no tendency towards any differences between the treatment groups in terms of pain and disappearance of paraesthesia. There was a tendency towards earlier return of grip strength (significant at 1, 2 and 3 weeks) and wrist motion (significant at 1 and 3 weeks) in the endoscopic group. Likewise, pillar pain tended to occur less frequently in the endoscopic group (significant at 6 weeks).

Sick leave tended to be shorter after endoscopic release (not significant). In the endoscopic group, one patient experienced transient increase of the paraesthesia. No other complications occurred.

Conclusions: The results indicate that the endoscopic procedure as we performed it, is safe and seems to have the benefit of faster rehabilitation.

Endoscopic carpal tunnel release in elderly patients

B Jacoby and T Bæk Hansen

Department of Orthopedics and Traumatology, Holstebro Central Hospital, Denmark

Our goal was to evaluate the outcome of endoscopic carpal-tunnel release among elderly patients (> 69 years of age) compared to younger patients.

Material and methods: Controlled prospective study comparing a group of patients aged > 69 years with a paired group of patients < 70 years of age.Recording of symptoms and functional status pre- and 2 months postoperatively using Levine-score (ref). Statistical comparison between two different age groups using Mann-Whitney rank-sum test and Wilcoxons rang-sum test. Level of significance = 0.05. Ten patients with a median age of 78 (78–94) years and a control-group of 10 patients with a median age of 48 (23–62) years.

Results: The two groups were comparable regarding preoperative symptoms and functional status.

There was significant effect of the operation in both groups, but at the clinical examination 2 months postoperatively the group of elderly patients had significantly lower level of function and significantly more residual symptoms compared to the control group. The overall patient-satisfaction was significantly less among the elderly patients compared to the younger patients.

Conclusion: In this study we found a significantly poorer result after endoscopic carpaltunnel release among the elderly patients (> 69 years of age) compared to younger patients. Long-time follow-up must determine whether this is due to a generally poorer result or it is due to slower restitution with the same final result.

Reference: Levine DW, Simmons BP, Koris MJ, Daltroy LH, Hohl GK, Fossel AH, Katz JN. A self-administred questionnare for the assesment of severity of symptoms and functional status in carpal tunnel syndrome. J Bone Joint Surg 1993; 75-A: 1585-91.

Implantation of Swanson arthroplasty in the carpometacarpal joint of the thumb

A K Bendsen, F H Mahdi, D Mikkelsen, P V Madsen and D Zdravkovic

Departments of Orthopedic Surgery and Radiology, Aalborg Hospital, Denmark

The purpose of the study was to evaluate the results after implantation of a Swanson silicone prosthesis in the first carpometacarpal joint in patients with osteoarthrosis. Clinical and radiographic reexamination was performed.

Material and methods: 24 patients had 25 implantations of a Swanson arthroplasty from January 1 1986 to December 31 1995. One man and 23 women with a mean age of 58 (47–72) years had been operated and 20 patients were reexamined. Two patients had died, and 2 patients had had the prosthesis removed. One patient was bilaterally operated. The mean follow-up time was 61 (18–88) months. The right hand was affected in 9 cases (all dominant) and the left hand in 12 cases (all nondominant).

Results: Preoperatively the primary complaint was pain in all patients. 8 hands were without pain at follow-up, 11 occasionally with minor pain, and in 2 hands there was more pain than before surgery. Radiography showed luxation in 6 and subluxation in 6 cases, prosthesis fracture in 1 case and prosthesis wear in 10 cases. Adduction contracture was found in 9 hands. In 2 patients the distance from the pulp of the thumb to the base of the fifth finger was 0.5 cm, in the other patients there was no distance. Contralateral affection was present in 15 patients. The mean ratio between the strength of key grip in the operated thumb and the other side was 1.22 (0.55–3.86).

Conclusion: Treatment of osteoarthrosis of the carpometacarpal joint of the thumb with a Swanson arthroplasty gives good patient satisfaction, relief of pain, and range of motion, and the strength of the thumb is improved.

Follow-up after Swanson arthroplasty of the metacarpophalangeal and interphalangeal joints of the 4 ulnar fingers

F H Mahdi, A K Bendsen, D Mikkelsen, P V Madsen and D Zdravkovic

Departments of Orthopedic Surgery and Radiology, Aalborg Hospital, Denmark

The purpose of the study was to evaluate the long-term results of Swanson arthroplasty of the metacarpophalangeal and interphalangeal joints.

Material and methods: We have reviewed and reexamined the patients that had an implantation of a Swanson arthroplasty in the metacarpophalangeal and interphalangeal joints of the 4 ulnar fingers in the period January 1 1985 to December 31 1995. 14 patients had 35 Swanson prostheses inserted due to rheumatoid arthritis (12), psoriatic arthritis (1) and fracture sequelae (1). All patients were operated by

the same surgeon (DZ). At follow-up we examined 10 patients. 3 patients were lost to follow-up due to death (1) and senile dementia (2). 1 patient has been reoperated recently with exchange of 2 arthroplasties due to ankylosis and implantation of 1 further arthroplasty. 6 patients had the implants in the metacarpophalangeal joints and 4 patients in the interphalangeal joints. All patients were women with a mean age of 63(32–88) years. The mean follow-up time was 57 (22–92) months. The patients were interviewed and reexamined clinically and radiographically.

Results: 8 out of the 10 patients were very satisfied, 1 was moderately satisfied and 1 was not satisfied with the result. 5 had a better range of motion and all had less pain than before surgery. 8 had a cosmetically more acceptable hand. At radiographic examination 2 prostheses were subluxated and 8 (in the same patient) had fractured. There were no cases of infection.

Conclusion: Treatment with a Swanson arthroplasty gives good relief of pain, a better range of motion and good patient satisfaction.

Is ultrasonography capable of identifying dislocation of a ruptured ulnar collateral ligament of the metacarpophalangeal joint of the first finger?

D Susic[1], B Rønn Hansen[2] and T Bæk Hansen[1].

Depts. of [1]Orthopedics and Traumatology, and [2]Radiology, Holstebro Central Hospital, Denmark

In case of a distal rupture of the ulnar collateral ligament of the metacarpophalangeal joint of the first finger, the ligament can be entrapped by the adductor aponeurosis resulting in dislocation and healing without stability disabling the patient's pinch grip. As a consequence most authors prefer exploration of a metacarpophalangeal joint of the first finger with instability of the ulnar collateral ligament, to determine whether the ligament is dislocated. Ideally the dislocated ligaments should be identified using a non-invasive technique, leaving the non-dislocated ligaments to conservative treatment, and the aim of this study was to determine whether examination with ultrasonography was able to identify the dislocated ligaments among the non-dislocated.

Material and methods: In 15 consecutive patients in the period 01.12.1995 to 30.09.1996 with clinical rupture of the ulnar collateral ligament verified by stress radiography and/or clinical examination ultrasonography was performed by one observer with extensive training in diagnostic ultrasonography before operative exploration by a "blinded" surgeon. There were 11 men and 4 women. There were 6 right hand lesions and 9 left hand lesions. Exclusion criteria were lesions more than 14 days old and former lesions of the joint. One patient (foreign citizen) had to be excluded, as he refused to have an exploration after having been examined by ultrasonography (showing a possible dislocated ligament), leaving 14 patients in the study.

Results: At exploration 5 out of the 14 ligaments were dislocated, but ultrasonography only discovered 2 (sensitivity 0.40). Ultrasonography was able to identify 7 out of 9 non-dislocated ligaments (specificity 0.78). In those cases, where ultrasonography was not able to give the correct information about ligament displacement, were evenly distributed in the investigation period and not located at the start of the period.

Conclusion: In conclusion we have not found the sensitivity of ultrasonography in this study to be sufficient for identifying dislocated ulnar collateral ligaments of the metacarpophalangeal joint of the first finger. As the failures were evenly distributed in the investigation period and we only used one observer, we do not think, that it primarily represents a learning curve. On the basis of our findings, we do not recommend ultrasonography for identifying dislocated ligaments in cases of rupture of the ulnar collateral ligament of the metacarpophalangeal joint in the first finger, and feel that operative exploration is still indicated in cases with clinical instability.

SPINE

Treatment strategy in extradural spine tumors

C Bünger, M Lauersen, S Eiskjær, K Thomsen, F Seiling and E S Hansen

Spine section, Dept. of Orthopedic Surgery, University Hospital of Aarhus, Denmark

Recent developments in spinal instrumentation systems and vertebral body replacements have radically changed the treatment protocols for both primary spine tumors and metastatic lesions.

From 1990 to 1996, 21 patients were surgically treated for primary extradural spine tumors: osteogenic sarcoma (2), Ewing sarcoma (1), chondrosarcoma (4), chordoma (2), osteoblastoma (3), osteoid osteoma (1), giant cell tumor (4), aneurysmatic bone cyst (1). Operative planning was performed from both MRI and CT- scans. Benign lesions were treated by curettage or en bloc resection and reconstruction with iliac crest bone and posterior CDI or Diapason. In 5 cases primary malignant tumors were approached by radical en bloc resection with simultaneous chest wall reconstruction using Dacron net. A combined posterior and anterior transthoracic extralesional approach was developed for removal of tumors. Care was taken to preserve medullary blood supply on one side of the cord. Tumor, partial vertebrae and adjacent ribs en bloc were removed by cutting segmental nerve roots via a dual anterior and posterior exposure of the spinal canal. No neurodeficits occurred postoperatively, and paraplegia in two cases returned to normal following decompression. Median blood loss was 3.7 (0.4–22.0) L, duration of surgery 5 (3–14) h, postop hospitalization was 15 (10–25) days. No postoperative wound infections occurred. Local recurrence of a sacral giant cell tumor in 2 patients has been identified necessitating reoperation.

Since 1992 radical corporectomy or vertebrectomy was performed in 35 patients with secondary spine tumors. The indications were solitary spinal metastases, spinal destabilization, progressive neurodeficits and an estimated life expectancy of 6 months. Metastases were classified according to Toinita on MRI examination of the whole spine. Via a primary anterior approach the neural structures were decompressed, the vertebrae removed and reconstructed by Harms titanium net, Sofamour Danek spacer, BWM spacer or iliac crest bone and the Kaneda device. Primary tumors were breast cancer (14), hypernephroma (2), adenocarcinoma of the GI tract (4), prostate cancer (5), and bronchogenic carcinoma (4), thyroid cancer (1), lymphoma (5). Total vertebrectomy was performed in cases with both anterior and posterior collum involvement. Oncological treatment was commenced 2 weeks postoperatively. Median blood loss 1.9 (1.2–4.0) L, duration of surgery 5 (4.5–7.0) h, postoperative hospitalization 20 (11–35) days. In 1 patient neurological status deteriorated from Frankel C to D. Relief of pain was found in the rest of the patients, who were able to walk without support postoperatively. No wound infections or device related failures occurred. One patient developed pulmonary infection. One patient with hypernephroma died 6 month postoperatively. In 20 patients with Tomita type 7 involvement (multiple spine metastasis) posterior decompression and spinal stabilization with titanium pedicle screws hook systems was undertaken. One patient experienced delayed skin healing necessitating secondary wound closure.

Conclusion: Major reconstructive spine surgery secondary to extradural spine tumors and metastatic lesions needs careful planning most often with dual anterior and posterior approach. Although time consuming demanding large surgical ressources it can be performed with low complications rates and high patient satisfaction. The treatment should be centralized to centers serving > 2 MIE people.

Surgical treatment of spinal deformity in Duchenne's muscular dystrophy

K Thomsen, O Nørregaard, S Eiskjær, and C Bünger.

Spine section, Department of Orthopedic Surgery, University Hospital of Aarhus

IDuchenne's muscular dystrophy (DMP) becomes clinically apparant before age 5 and the average patient becomes wheelchair-bound at age 10 and dies from respiratory dysfunction or cardiomyopathy in early adulthood. All patients develop progressive spinal deformity most often from the time of loss of walking ability. The indications for surgical treatment of the scoliosis include cosmetic, sitting comfort, and improved respiratory function, and accounts for one third of the spinal surgery in neuromuscular deformities in the above department. The aim of the present study was to evaluate this treatment with special focus on complications.

Materials and methods: 9 boys with mean age 17 (13–21) years with DMP were operated on between 1990 and 1996 and the follow-up is minimum 6 months. They all had posterior instrumentation (C-D in 8 patients and Synergy in 1) and the fusion was from Th4 or Th5 to the sacrum in 7, Th11 to the sacrum in 1, and Th4 to L4 in 1 patient.

Results: Duration of the operation was 385 (235–700) min, blood loss 2.9 (0.6-6.0) L, and cell-saved 39% (20%-79%). I.C.U.-stay was 4.5 (2–9) days and mean postoperative day of discharge 15 (8–27). All patients survived the operation and the immediate postoperative period but 2 patients died between 2 and 4 months postoperatively, corresponding to a mortality rate of 22%. The first patient suffered significant pulmonary dysfunction and the second patient significant cardiomyopathy. One patient not in the above material was listed for surgery but suffered severe weight-loss due to ileus from deformation of the duodenum secondary to the severe spinal deformity. The operation had to be postponed. A detailed case presentation of these three patients is given.

Conclusion: All patients with DMP develop progressive scoliosis and early surgery is recommended. For the 2 patients with fatal outcome the severity of the cardiopulmonary dysfunction would have been revealed in a 6-week postoperative out-patient anesthetic follow-up. This is now part of our routine.

Scoliosis surgery in patients with Duchenne's muscular dystrophy

T Jørgensen, M Andersen, G Rahbek Andersen, S Bach Christensen

Department of Orthopedic Surgery, Rigshospitalet, University of Copenhagen

The main indications for operative correction of scoliosis in patients with Duchenne's muscular dystrophy are: Better sitting balance, avoiding brace treatment, stopping the progression of the curve, diminishing the reduction in vital capacity and prolonging life span. The operative effect on sitting balance and curve-progression is examined.

Material and methods: 17 patients with Duchenne's muscular dystrophy operated with long fusions from 1983 to 1994 at The Copenhagen University Hospital, Rigshospitalet; average follow-up period was 2 years. The average age at the operation was 16 years. 13 patients had Cotrell-Dubousset instrumentation, 3 had Harrington-Luque, 1 had Luque-Galveston and 1 had Harrington. The clinical reports and radiographs were examined.

Results: Pelvic imbalance is improved from 24° to 13°. The average correction of the Cobb-angle was 42%, from 71° to 41°. 3 patients were operated successfully with pre-operative vital capacity less than 21% of normal.

In 3 cases re-fixation had to be performed because of loosening of material. There were no long-lasting complications.

Conclusions: Sitting balance is dramatically improved-Low pre-operative vitalcapacity is only a relative contraindication. Earlier operation is recommended.

HIP

Müller straight stem—survival rate after 12 years

K P Sperling, P Gebuhr and S Stephensen.

Dept. of Orthopedics, Hvidovre Hospital, Copenhagen

We have previously presented, the clinical results and the survival rates, after up to seven and ten years observation of the Müller straight stem, in the Danish Orthopedic Society. These results have been promising, and comparable with the results of the Swedish National Hip Arthroplasty Register. The latest results from the Swedish National Hip Arthroplasty Register however, showed a significant higher risk for revision of the Müller straight stem, 12-year postoperatively compared to the Charnley, Lubinus IP and C.A.D. implants. We have calculated the 12 years follow-up survival rate of the Müller straight stem implanted in our department.

Material and methods: From 1984 to 1988, 388 women and 177 men had a cemented Müller straight stem prosthesis, in 621 hips. Median age at operation was 71 (24–94) years. The patients were searched in a nation wide register for revision on the implanted hip. Survival rate based on performed revision for aseptic loosening of the acetabular component, the femoral component or both was calculated.

Results: The median observation time was 107 (1–152) months. 25 hips were reoperated. 6 hips were revised for infection. 2 acetabular components were revised for luxation. 16 hips were revised for aseptic loosening of the femoral and the acetabular component, and 4 hips because of loosening of the acetabular component. Survival based on performed revision for aseptic loosening was 95.1 %.

Conclusion: The survival rate, 12 years after Müller straight stem is satisfactory.

References

Malchau H., Herberts P, Ahnfelt L. Prognosis of total hip replacement in Sweden. Acta Orthop Scand 1993; 64 (5): 497-506.

Malchau H, Herberts P. Prognosis of Total Hip Replacement. The 63rd Annual Meeting of the American Academy of Orthopedic Surgeons, February 22–26, 1996, Atlanta, USA.

Dislocation rate after primary total hip replacement ad modum Exeter

Keld Daubjerg and Michael Kaltoft

Department of Orthopedics, Middelfart Hospital

The aim of the study was to report the dislocation rate after primary total hip replacement (THR) ad modum Exeter with special interest in the use of two different femoral head sizes (28 and 30 mm).

Materials and methods: From February 1990 through October 1994, 498 primary THR were made in our department. All hips were made with the polished tapered collarless Exeter stem with modular head.

All operations were performed by posterior approach with the acetabular cup of 40° of abduction and 10° of anteversion. The stem was placed in 10–15° of anteversion. Postoperatively a triangular pillow splint was used in the bed for 3 days. When mobilized, restrictions were made to prevent excessive flexion and internal rotation.

A 28 mm femoral head was used in 50 hips, a 30 mm femoral head in 446 hips.

2 patients (2 hips) were excluded as a different head had been used. The study was a retrospective reading of the case records and radiographs.

Results: 10 hips in 10 patients (2.0%) (6 women, 4 men) dislocated primarily between the day of the operation and 9.5 months postoperatively (median 15 days). 5 of these patients (1%) (3 women, 2 men) had been revised. 4 hips because of a too vertically placed cup, and 1 hip because of a too anteverted stem.

In the 30 mm femoral head group 8 hips (1.8%) dislocated postoperatively. 5 of these were revised (1.1%). In the 28 mm femoral head group 2 hips (4%) dislocated postoperatively, but none of these needed to be revised.

The revision was made 17, 44, 46, 47 and 158 days after the first operation. The maximum number of dislocations was for each patient 3.

Conclusion: Using a 28 mm or a 30 mm femoral head seems to make a difference, as no revisions have been made with the 28 mm head, knowing that the number of patients in the 28 mm femoral head group is small.

Compared with other studies we seem in our department to have an acceptable, low dislocation rate postoperatively, in addition, also a low revision rate.

Aseptic loosening and clinical result in total hip replacement with the use of Boneloc, Simplex or Palacos cement

K Daubjerg and M Kaltoft.

Department of Orthopedics, Middelfart Hospital.

The aim was to report the result and frequency of aseptic loosening in three different kinds of cement in total hip replacement (THR) with the polished tapered collarless Exeter stem. Special interest in aseptic loosening of Boneloc cemented prosthesis.

Materials and methods: From February 1990 through October 1994 498 THR were made. 33 patients (35 hips) were revised. Of those aseptic loosening in 19 patients (20 hips). 14 patients (15 hips) were revised for other reasons. 52 patients (59 hips) had died and 14 patients (15 hips) would not or could not attend follow-up examination. 389 hips were then available for follow-up. Together with the 35 revised hips Boneloc cement was used in 273 hips, Simplex in 103 hips and Palacos in 48 hips. Clinical results were evaluated using the Harris hip-score.

Results: At follow-up 20 hips in 19 patients (4.7%) had

been revised because of aseptic loosening (both components in 9 hips, acetabular cup in 10 hips and femur stem in 1 hip). Revision took place after median 31 (1–67) months.

	Median FU (years)	Revision rate (hips)	(percent)	Median subsidence (mm) 3 mo	At FU
Boneloc	3.8	14*/273	5.1% NS	0 (0–5)	3 (0–21)
Simplex	4.5	3/103	2.9% NS	0 (0–6)	1 (0–18)
Palacos	3.6	3/48	6.3% NS	1 (0–4)	2 (0–9)
Total	3.9	20/424	4.7% NS	0 (0–6)	2 (0–21)

*3 hips out of these were peroperatively not loose.

16 hips (3.8%) had a structural graft in the acetabulum. 6 of these were revised (38%), (Boneloc 2 out of 10, Simplex and Palacos both 2 out of 3. In other words 6 hips out of 20 in the revision group had primarily a structural graft (30%). Average Harris hip-score in the follow-up group was 88 (16–100).

Conclusion: The 4-year result after primary Exeter replacement with Boneloc cement does not show a considerable different revision rate compared with Simplex or Palacos cement. However, there is an increased subsidence between the femur stem and the cement in the Boneloc group. The clinical result was good in all three groups. Structural graft in acetabulum gives a high revision rate.

Long-term results after cemented revision of the femoral component in THA

T H Jensen, J Gramkow, J E Varmarken and J B Retpen

Department of Orthopedics, Rigshospitalet, Copenhagen

Deterioration of bonestock is a significant risk factor of repeated aseptic loosening of the cemented femoral revision component. It has been demonstrated that the use of modern cementing technique and longer revision components will improve longevity of the cemented femoral revision component.

Material and methods: 84 consecutive first-time cemented revisions of femoral components were performed from 1981 through 1988 using Lubinus long-stem revisio components. The median time to follow-up was 12.6 years. Patients representing 47 revisions had died. Two of these had been re-revised. Of the living patients, 12 had been re-revised leaving 25 patients for clinical and radiological evaluation. Clinical outcome was estimated through questionnaires including a painscore and a modified Harris Hip Score. One patient could not be traced, one patient answered the questionnaire but did not want radiographic examination, and one patient did not want to participate in the evaluation at all. The remaining 22 patients were all both clinically and radiologically assessed.

Results: 15 of 22 patients had no pain, four had only slight pain, and four had marked pain. In 4 cases there were definite radiological signs of loosening of the femoral component. Risk of re-failure of the femoral component was estimated using Kaplan-Meier survivorship analysis with performed re-revision or radiographic signs of loosening as end-point. The 10-year survival rate in this series was found to be 78%.

Conclusion: The results after cemented revision of femoral components in this unselected consecutive series are acceptable. If patients are selected according to the well-known risk-factors, age and loss of bone, even better results can be expected. We conclude, that simple recementation is well indicated in older patients with only minor loss of bone.

Intramedullar resorbable cement restrictor versus intramedullar nonresorbable cement restrictor in total hip replacement

K Gade Freund, N Herold, P Riegels-Nielsen and N D Röck

Department of Orthopedics, Esbjerg Hospital, Denmark

To achieve an adequate fixation in cemented hip replacement, an effective sealing of the femoral canal with a cement restrictor is important. The aim of this study was to compare two types of cement restrictors with regard to the degree of migration of the restictor and to the amount of cement leakage.

Material and methods: A fully resorbable cement plug made of copolymer (Shuttle Stop) was tested against a non-resorbable polyethylene plug (De Puy). In the period from November 1995 to June 1996, 70 patients with cemented stems and cemented or uncemented cups, were randomized at the beginning of the operation to either a resorbable or a non-resorbable femoral plug with 35 patients in each group. The plugs were inserted according to the instructions. Postoperatively the patients were allowed full weight bearing. Radiographs were taken postoperatively and after 3 months. The deformation of the plugs was categorized in 5 classes with respect to the degree of deformation and the migration. Class 1 was the ideal position with sufficient cement under the tip of the prosthesis. Class 2–4 indicates deformation of the plug but with sufficient cement distally. Class 5 presented migration of the plug with insufficient cement under the tip of the prosthesis (failure). The presence of cement-leakage was recorded.

One patient was excluded due to other complications peroperatively. 29 women and 40 men were included. The average age was 67 (39–85) years with no difference in the two groups.

Results: In the non-resorbable group there were no failures and 3 cases with cement leakage. In the resorbable group there were 8 failures ($0.001 < p < 0.01$) and 13 cases of cement leakage ($0.001 < p < 0.01$).

Conclusion: The resorbable plug (Shuttle Stop) can not be recommended at the present stage of development, since a high degree of migration of the plugs and cement leakage has been observed, and proper fixation thereby seems to be compromised. The population will be followed with the purpose to describe the long time consequence.

Dynamic hip screw versus 3 parallel screws in the treatment of Garden 1+2 and Garden 3+4 cervical hip fractures

N Levi and J Retpen

Department of Orthopedic Surgery, Rigshospitalet and Frederiksberg Hospital, Copenhagen, Denmark

Reoperations after osteosynthesis of cervical hip fractures are frequent, occurring in about 30 %. Large studies comparing the clinical results after different types of fixation for femoral neck fractures are rare. The purpose of this study was to evaluate the failure rate following operations of undisplaced and displaced cervical hip fractures with a dynamic hip screw compared with 3 parallel screws.

Patients and methods: During a period of 4 years (January 1990 to December 1993) 206 fractures of the neck of the femur (163 in women and 43 in men) were treated at Frederiksberg University Hospital with a dynamic hip screw. The median age was 80 (50–98) years. According to Garden's classification 98 fractures were of type 1+2 and 108 fractures were of type 3+4.

During the same period 250 fractures of the neck of the femur (189 in women and 61 in men) were treated at the Rigshospital with 3 parallel screws. The median age was 79 (51–100) years. According to Garden's classification 154 fractures were of type 1+2 and 96 fractures were of type 3+4. The dynamic hip screw used was Dual-Biomet. The 3 parallel screws used were Ullevaal-Howmedica. As a rule the operation was performed as soon as possible after admission. Physiotherapy began the day after the operation and the patients were mobilized, fully weight-bearing if possible. The average follow-up time was 2.5 years.

Results: A total of 456 cervical hip fractures were operated. The failure rate for fractures treated with a dynamic hip screw was 14/98=14% for Garden 1+2 fractures and 43/108=40% for Garden 3+4 fractures. The failure rate for fractures treated with 3 parallel screws was similar: 23/154=15% for Garden 1+2 fractures and 38/196=40% for Garden 3+4 fractures. The majority of failures occurred within the first 4 months (70% for fracture treated with a dynamic hip screw and 66% for fractures treated with 3 parallel screws).

Discussion: Our failure rate following internal fixation of Garden 1+2 cervical fractures and Garden 3+4 was comparable to that in other series. The optimal method for fixation of these fractures is still being sought, and the fact that no single universally accepted devise exists is reflected in the number of different methods of fixation.

References

Herngren B, Mork-Petersen, Bauer M. Uppsala screws or Hanssons pins for internal fixation of femoral neck fractures. Acta Orthop Scand 1992; 63: 41-46.

Rehnberg L, Olerud C. Fixation of femoral neck fractures. Acta Orthop Scand 1989; 60: 579-84.

Zetterberg C, Elmersson S, Andersen GBJ. Reoperation of hip fractures. Acta Orthop Scand 1985; 56: 8-11.

Treatment of unstable trochanteric fractures with the Sliding Hip Screw and the Trochanteric Stabilizing Plate

C Fink Jepsen, T M Klebe and N Krarup Jensen

Department of Orthopedics, Viborg Hospital, Denmark

In unstable trochanteric hip fractures there is a risk of insufficient primary reduction of the fracture, secondary fracture displacement and femoral medialization. Parker described 42% of his cases with more than 30% medialization and 59% with some medialization.

This study was constructed retrospectively to confirm the results of the treatment of the unstable hip fractures in our hospital with the sliding hip screw combined with the trochanteric stabilizing plate (Stratec Medical).

Material, methods and results: From Dec. 1993 to June 96 we treated 26 patients, mean age 76 (25–97) years with 26 unstable trochanteric fractures, according to Jensen classification, type 3 (2), type 4 (2), type 5 (18), transtrochanteric (1) and subtrochanteric (3). Selection of the patients was done peroperatively by the operating doctor.

We made a clinical and radiographic follow-up after at least 3 months, mean: 16 (3–36) months, which left 20 of the 26 patients available. 5 patients died within 3 months and 1 patient was only seen after 1.5 months.

At the follow-up 3 patients had secondary fracture displacement. In one we had to remove the osteosynthesis material because of infection.

We saw femoral medialization in 3 patients (0.6, 0.8, 1.6 cm), only 1 had more than 30% medialization. In one of these the primary fracture-reduction was insufficient.

Telescoping of the sliding screw was seen in 13 patients (mean 1.5 (0.2–2.8) cm).

Conclusion: We found that 16 of 20 fractures were successfully treated by this method. 1 of the cases which failed was due to insufficient reduction of the fracture and 1 due to deep infection. It seems that the trochanteric stabilizing plate is able to prevent secondary fracture displacement and femoral medialization

We find the stabilizing plate very easy to use, and that the stabilizing plate in combination with the sliding hip screw is a very good alternative way to deal with the unstable hip fractures.

Long gamma nail in the treatment of subtrochanteric fractures

L Solgård and B Klareskov

Department of Orthopedic Surgery, H:S Hvidovre Hospital

We evaluated the per- and postoperative problems and complications related to the use of the long gammanail in subtrochanteric and complex proximal femoral fractures.

Material and methods: We retrospectively studied case records of 34 patients. Radiographs were studied in order to determine signs of fracture union, and to evaluate the techni-

cal result. Complications and technical problems were recorded.

Results: We observed 3 femoral fractures that occurred peroperatively, 2 complications related to the distal locking, 1 distal protrusion of the guide wire. 2 cases of problems introducing the nail into the medullary canal. Problems with closed reduction of the fracture, causing postoperative malpositioning. No infections. We found non-union in 3 cases, all primarily DHS osteosynthesized, reoperated because of primary non-union with the DHS-device. 23 patients were allowed full immediate postoperative weightbearing, 11 patients not until the 4'th-10'th postoperative week because of presumed non-stable osteosynthesis.

Conclusion: The operative procedure can be technically demanding. We will critically review the indications and the surgical procedure as most of the peroperative complications could be avoided by more careful technique. We recommend special attention towards fracture alignment. Sufficient reaming and correct locking procedure is essential.

Nephrotoxicity by dicloxacillin and gentamicin in 163 patients with trochanteric hip fractures

L Solgård, J Tuxøe, M Mafi, S Due Olsen and T Toftgaard Jensen

Department of Orthopedic Surgery, H:S Hvidovre Hospital

The aim of this retrospective study was to evaluate the nephrotoxicity after peroperative antibiotical prophylaxis with gentamicin and dicloxacillin.

Material and methods: Group I: 87 patients received a peroperative dose of 2 g dicloxacillin and 240 mg of gentamicin given intravenously as a one-time administration dose.

Group II: 76 patients had no antibiotic prophylaxis. All patients were osteosynthesized with the DHS-device.

Results: A significant increase in se-creatinine values postoperatively was seen in patients receiving peroperative antibiotics. We observed 20 cases of reversible and one case of irreversible kidney toxicity (Group I: 16 reversible, and 1 irreversible, and group II: 4 reversible kidney affections).

Peroperative infection prophylaxis did not have any significant effect in reducing infections, although a marked tendency ($p = 0.07$) towards a positive prophylactic effect was shown.

Conclusion: The clinical significance of the shown toxicity of the prophylaxis is uncertain. Further investigations concerning the benefit of antibiotic prophylaxis in trochanteric hip fracture operations are recommended.

Hip fractures do not increase one year mortality

K Hindsø and J Bruun Lauritzen

Dept. of Orthopedics, Hvidovre and Bispebjerg Hospital, University of Copenhagen

Mortality following hip fractures is increased due to several factors. The significance of the hip fracture itself has been discussed in several studies.

Material and methods: A cohort of 1,685 orthopedic inpatients of at least 75 years of age were consecutively interviewed and followed for up to 2 years (median: 1 year). The cohort consisted of 545 hip fracture patients, median age 85 years, and 1,140 patients without hip fracture, median age 83 years. The proportion of women was 81%. On admittance following variables were recorded: SEX, AGE, DEMENTIA, MEDICAL DISEASE, HIP FRACTURE, OTHER FRACTURE, admitted after a FALL, and NURSING HOME resident. Follow-up was calculated on exact dates.

Cox proportional hazards model was used to determine the effect on mortality for each of the variables alone and in a multivariate model based on backward elimination.

Results: One year survival of the hip fracture group was 72% and in the non hip fracture group 83%. In the univariate analyses all variables were significant. Hip fractures increased the mortality rate by a factor 1.75 (95% CI 1.42–2.16).

Taking account of the variables SEX, AGE, DEMENTIA, MEDICAL DISEASE and NURSING HOME there was no increased mortality associated with FALL, HIP FRACTURE and OTHER FRACTURE in the multivariate model.

Conclusion: Increased mortality during the first year following hip fractures is due to other factors than the hip fracture itself.

Treatment of distal femoral fractures with intramedullary supracondylar nails

J B Gynning and D Hansen

Department of Orthopedics, Gentofte, University of Copenhagen, Denmark

Internal fixation has become the treatment of choice of distal femoral fractures. Compared with non-operative treatment, surgical fixation provides superior anatomic alignment, and a stable fixation allowing early functional rehabilitation and mobilization.

Intramedullary supracondylar nails (IMSC) are introduced through a medial parapatellar incision, thus providing a method of internal fixation of these fractures, avoiding an extended soft tissue damage during the reduction and fixation.

Material and methods: From February 1994 to November 1996, a total of 30 consecutive distal femoral fractures in 29 patients underwent internal fixation with an intramedullary supracondylar nail.

There were 27 females and two male patients. Median age 81 (30–94) years. All fractures were closed. None of the fractures were pathological. 8 of the patients had a hip-screw, 4 had a TKA, 1 a THA, and 2 patients were below-knee amputated on the fractured leg. Follow-up was done in 20 patients after median 15 (4–36) months. 9 patients had died from unrelated reasons prior to follow-up.

Results: 26 of the fractures healed in median 3 (2–15) months. 2 patients died before fracture union. In 2 patients reoperation was performed. In 5 patients the distal locking screws backed out and were removed, this did not interfere with the final result. No patient had tenderness at the fracture site, but 3 patients had experienced osteoarthritic knee pain after the operation. 20 patients regained their previous mobility. In 9 patients the mobility had decreased moderately, (had to use two crutches compared to one before ect.). All patients achieved knee flexion of at least 90°, in 3 patients an extension deficiency of 10° was found. There were no cases of infection or thromboembolic complications.

Conclusion: IMSC provides a method of stabile internal fixation of distal femoral fractures, facilitating nursing and advancing mobility.

A prospective study of bone mineral density in the proximal femur and proximal tibia following fracture of the hip

B Zerahn, C Olsen, S Stephensen, I L Kanstrup and G Lausten

Depts. of Orthopedic Surgery and Clinical Physiology, Copenhagen County Hospital, Herlev

The aim of this study was to quantify changes in bone mineral density (BMD) in the opposite hip and both proximal tibiae as well as the use of walking aids in patients with two types of hip fractures during the first year after surgery.

Materials and methods: 26 women and 15 men aged median 71 (42–88) years. 21 patients had a femoral neck fracture (FNF) and 20 had a trochanteric fracture (TF). All patients were treated with a dynamic hip screw. BMD was measured by dual x-ray absorptiometry (DXA) (LUNAR, Wisconsin) within the first week after surgery and after 3, 6 and 12 months.

Results: Initial BMD of the non-fractured hip was significantly lower for both fracture groups and sexes compared to a large normal material, but with no difference in the first postoperative BMD measurements between the two fracture groups. For both fracture types there was a significant decrease in BMD of the non-fractured hip and proximal tibia of the fractured leg during the first 3 months which persisted a year after surgery. Improved mobilization between two examinations was associated with an increase in BMD of the proximal tibia of the fractured leg and the non-fractured hip, but not in the proximal tibia of the non-fractured leg. Three months after surgery patients with TF used more walking aids than patients with FNF, while there was no difference a year after surgery.

Conclusion: Patients with hip fractures have an increased bone loss in the fractured leg but also in the non-fractured hip. Changes in BMD due to poor mobilization after hip fracture are reflected by a decrease in both BMD of the ipsilateral proximal tibia and in the contralateral hip, whereas BMD of the proximal tibia of the non-fractured leg remains mainly unaffected.

KNEE

Intraarticular knee lesions—accuracy of clinical examination and the benefit of MRI

B Munk[1], F Madsen[1], E Lundorf[2], H Staunstrup[1], S A Schmidt[1], L Bolvig[3], M B Hellfritzsch[3] and J Jensen[1]

Depts of [1]Orthopedics and [3]Radiology, Aarhus Amtssygehus, and MR-center[2] Skejby Sygehus, Aarhus University Hospital

The accuracy of arthroscopy has been reported to be 69–98%, but is widely accepted as the reference in validation of other diagnostic tools in knee injuries. To reduce the number of blank arthroscopies and to improve our pre-operative planning, we evaluated the accuracy of our clinical examination and MRI, using arthroscopy as a reference.

Material and methods: In a double-blind prospective study of 100 consecutive patients 61 (40 men and 21 women, mean age 31 (15–54) years) were included. They were all evaluated by interview, clinical examination, MRI and finally arthroscopy.

Results: 60 were out-patients and 1 was hospitalized. Arthroscopy was performed in local anesthesia in 47 patients, and in general anesthesia in 14 patients. At arthroscopy 25 lesions of the meniscus were found (19 medial and 6 lateral), and 16 (9 partial and 7 total) ACL lesions, 0 PCL lesions and 26 (5 arthrosis and 21 "other types") cartilage lesions.

Sensitivity, specificity, accuracy in percentages

	Meniscus	ACL	Cartilage
Clinic	100 6, 44	50, 100, 87	15, 97, 62
MRI	84, 75, 79	44, 96, 82	0, 97, 56

The combination of clinical and MRI findings would have reduced the number of blank arthroscopies to 5% , and if we had used the findings by MRI before/in the planning of the anesthesia/arthroscopy, we could have avoided all of the 7 secondary arthroscopies we had to perform.

Conclusion: In meniscal tears we could certainly benefit from the MRI findings, but the clinical relevance of MRI in ACL and cartilage lesions is doubtful. Adding MRI to the clinical examination could reduce the number of blank arthroscopies to 5%, and furthermore eliminate the need of a second arthroscopy.

Prospective randomized investigation of periosteal transplantation to severe osteochondritis dissecans lesions in human knee joints

B Niedermann, K Andersen, T Christensen, L Juhl Jensen, O Myhre Jensen, F Madsen and C Møger

Depts. of Orthopedic Surgery and Pathology, Århus University Hospital and Diagnostic Radiology, Skejby University Hospital, Denmark

Adult patients with osteochondritis dissecans lesions of the knee joint have a high risk of developing gonarthrosis. Reconstruction of articular lesions with biological material is still a subject for further investigation. The aim of this study was to evaluate the healing potency of periosteal transplantation to osteochondral lesions in human knee joints.

Material and methods: During the period from Oct. 1987 to Feb. 1991 23 patients with osteochondral lesions of the medial femoral condyle of the knee joint were included in the study. Finally five patients were omitted. Of the remaining 18 patients 8 patients underwent periosteal transplantation and 10 patients simple excision of the lesion. Average age was 26 (16–37) years, 6 women and 12 men. The average size of the osteochondral lesion was 21 (12–30) x 14 (8–20) x 8 (4–20) mm. The periosteal tissue was fixed to the excavated bony cavity with the fibrin sealant Tisseel. All the patients were treated with continuous passive motion for two weeks postoperatively.

Results: In all the cases the cavity of the lesion was filled up with mainly fibrocartilaginous tissue. Three out of eleven patients (27%) with periosteal transplantation had loosening of the periosteal tissue during the first year. All the patients had improved clinically at the one year follow-up compared with the preoperative status. Evaluation after one year revealed no significant differences by CT-scan, MR-scan, arthroscopy, biopsy or by Lysholms kneescore.

Conclusion: No benefit could be demonstrated in the periosteal transplantation group compared with the group of simple excision in the treatment of osteochondral lesions in human knee joints at the one year follow-up. The fibrin sealant Tisseel may exert an inhibitory effect on the in-growth of cells in the regeneration of the periosteal tissue. At one year follow-up there was no sign of new bone formation in the bottom of the excavated bony cavity in the femoral condyle.

Does the transligamental portal for knee arthroscopy cause damage to the patellar tendon—an investigation of the patella tendon with ultrasonography after transligamental arthroscopy of the knee

D Blohm[1], B Bojsen[1], S M Sørensen[2] and T Bæk Hansen[1]

Depts. of [1]Orthopedics and Traumatology, and [1]Radiology, Holstebro Central Hospital, Denmark

In diagnostic and therapeutic arthroscopy of the knee joint, the transligamental portal is often used especially in the Scandinavian countries. With an increasing number of reconstructions of the anterior cruciate ligament using the central part of the patellar tendon (the "Bone-tendon-bone" technique), we wanted to investigate, if the transligamental portal was causing damage to the patellar tendon.

Material and methods: In 35 consecutive patients (11 females and 24 males) who had a knee arthroscopy performed on a suspected meniscal lesion, we made a clinical examination and ultrasonography of the patellar tendon preoperatively, after 2 and after 6 months.

Patients with preoperative complaints of anterior knee pain, former arthroscopy or known anterior cruciate ligament lesion were excluded.

Results: At the 6-months follow-up, 20 patients had tenderness of the patellar tendon at examination. 10 patients had signs of granuloma formation and 4 patients had signs of perifibrosis/peritendinitis at ultrasonography.

There was no statistical significant correlation between tenderness of the patellar tendon and granuloma formation ($p=0.48$, Fisher's exact test) or perifibrosis/peritendinitis ($p=0.78$, Fisher's exact test).

Conclusion: In conclusion, we found more than 25% of the patients with signs of granuloma formation at the ultrasonography, and more than 50% complained of tenderness of the patella tendon. The consequences of the postoperative changes in the patella tendon after 6 months seen on the ultrasonography are uncertain, as there was no statistical significant correlation between the findings at ultrasonography and the claims of tenderness. Further studies are recommended to investigate the changes in the patella tendon after using the transligamental portal in knee arthroscopy.

Pathoanatomy of acute patellar dislocation

S Winge, M Skriver and T Toftgaard Jensen

Department of Orthopedic Surgery, Hvidovre Hospital

Recent studies indicate that tear of the medial patellofemoral ligament (MPFL) at the level of the adductor tubercle plays a role in the pathoanatomy of patellar dislocation. The purpose of this study was to elucidate the pathoanatomy associated with patellar dislocation.

Material and methods: 9 patients (2 women and 7 men), median age 25 (15–40) years, with first time acute patellar dislocation underwent arthroscopy and open medial exploration of the medial retinaculum and MPFL. A torn MPFL was repaired end to end or with Mitec anchors back to the adductor tubercle. Tear of the medial retinaculum was repaired.

Results: Acute patellar dislocation was associated with tear of the MPFL at the level of the adductor tubercle in 8 out of 9 patients. Tenderness over the adductor tubercle was found in 8 patients, tear of the medial patellar retinaculum in 5, effusion in 7 and osteochondral fracture in 4 patients.

Conclusion: Tear of the MPFL at the level of the adductor tubercle is part of the pathoanatomy of patellar dislocation, though the significance has not yet been proved.

References

Avikainen VJ, Nikku RK, Seppänen-Lehmonen TK. Adductor magnus tenodesis for patellar dislocation. Clin Orthop 1993; 297: 12-16.

Conlan T, Garth WP Jr, Lemons JE. Evaluation of the medial soft-tissue restraints of the extensor mechanism of the knee. J Bone Joint Surg 1993; 75-A: 682-93.

Salley PI, Poggi J, Speer KP, Garrett WE. Acute dislocation of the patella. Am J Sports Med 1996; 24: 52-60.

Reconstruction of ACL as an office-procedure

P Mønsted Nørgård and J Yde

Department of Orthopedics, Herning Centralsygehus

With the introduction of arthroscopic ACL-reconstructions the morbidity of the operation has become very small. In a prospective series of arthroscopic ACL-reconstructions we wanted to follow medical complications and the patient compliance according to confidence, pain and social problems.

Material and methods: 27 patients were operated on. 2–3 weeks before the operation the patient was interviewed and selected for the procedure and instructed. At the operation day the first patient arrived at 8 a.m. and the next at 10 a.m.. The patient was after own choice operated in general or spinal anesthesia. An arthroscopic procedure using the semitendinosus and the gracilis tendons as grafts fixed with the Endo-Button and staples was selected. The patients were expected to leave the hospital between 4 and 6 p.m. with crutches, partial weightbearing, coolbackage and a "pain-box" with NSAID, paracetamol and Vilan.

A questionnaire was filled in over three days and at the fourth days the patients were seen at the clinic.

Results: 2 patients had to stay at the hospital because of nausea and a spinal anesthesia lasting for 8 hours. On VAS from 0–10 the average pain-score was: day one 4.0; day two 3.2 and day three 2.4. The patient compliance was excellent. All patients were ready to do the same procedure once more. No surgical or anaestesiological problems were seen during the first 4 days. Average extension was 2° and average flexion was 89° at the fourth day.

Conclusion: As a office-procedure arthroscopic ACL-reconstruction using the semitendinosus and gracilis tendons as grafts is a safe procedure with good patient compliance.

Revision of failed ACL reconstructions

B Wulff Jakobsen

Division of Sports Trauma, University Hospital of Aarhus, Aarhus

Arthroscopically assisted ACL reconstruction has been shown to be the treatment of choice for primary or chronical ACL insufficiency. With an increasing number of ACL reconstructions the need for revision ACL reconstruction will increase. Synthetic prosthetic grafts as well as synthetic augmentation of ACL reconstruction has been shown to have an unacceptable high failure rate. The purpose of this study was to evaluate our results of revision procedures following failed ACL reconstruction.

Material and methods: Between 1994 and 1996 416 ACL reconstructions were performed in our clinic. 9 cases were multiple ligament surgery. In 5 cases high tibial osteotomi and ACL reconstruction were performed in one procedure. 26 cases were revision cases. The failed procedures were primary sutures with or without augmentation, 13 cases of bone patella bone grafting with synthetic augmentation, 3 cases of prosthetic graft materiel and 2 cases of bone patella bone graft without augmentation. The revision procedures performed included 19 bone patella bone reconstructions and 7 cases of quadruple semitendinosus and graciles ACL reconstructions.

Results and conclusion: At follow-up 6–30 months postoperatively all had improved concerning objective stability. Arthroscopic assisted ACL revision surgery is demanding. Good preoperative evaluation and surgical timing is recommended. Patient and surgeon must be prepared for a two-stage procedure. The overall results are related to preoperative osteoarthritis and preexisting concomitant lesions.

Impacted cancellous bone grafting and recementing of loose components in rigid hinged knee arthroplasty

C Pedersen and P T Nielsen

Department of Orthopedic Surgery, Aalborg Hospital

Rigid hinged prostheses were used in the early years of total knee arthroplasty but were abandoned because of high failure rates. We have used a hitherto not published revision procedure in three patients with hinged prostheses.

Material and methods: 3 elderly women who had 11–15 years old rigid hinged knee prostheses were revised because of aseptic loosening and severe osteolysis with imminent risk of periprostetic fracture.

The main clinical feature was constant pain. The average Knee Society scores were 43 points and the function score 32 points.

At surgery the hinge was separated, the loose component removed and cleaned, osteolytic bone was curetted, morsellized allograft bone was impacted and the component recemented before the hinge was reassembled.

The patients were braced for 6 weeks before starting weight bearing as tolerated.

Results: At follow-up 12–18 months postoperatively the patients had only slight occasional pain. The Knee Society scores were on average 83 points and the function score 53 points. Radiographs showed initial subsidence in one of the components, but no further signs of loosening.

Discussion: Impacted cancellous bone grafting and recementing is a new procedure in salvage of loose knee hinged arthroplasty components. The procedure is inexpensive and surgically less demanding. The short term clinical results were good and in elderly patients with low activity leve. It may prove to be a lasting solution and a good alternative to arthrodesis or amputation.

Complex reconstruction in revision knee arthroplasty using the Coordinate knee prosthesis

J Kaspersen, H Kristensen and E Hørlyck

Department of Orthopedic, Silkeborg Centralsygehus

Revision knee arthroplasty becomes more frequent as the number of primary knee arthroplasties rises. In respect to this, the need for valid methods, making it possible to obtain an acceptable result, is growing. The challenge in dealing with revision arthroplasty is the bone loss, ligamentary imbalance and osteoporosis in relation to aseptic loosening, infection and trauma. The revision knee arthroplasty should be able to deal with those problems and the Coordinate knee-arthroplasty-system represents such an arthroplasty.

Material and methods: We present 7 patients who underwent revision knee arthroplasty, in our department, using the Coordinate knee prosthesis (DePuy). The reasons for revision were, aseptic loosening, infection, trauma and primarily unfitted prostheses and/or instability. 3 patients had infection. Their operations were done in a two-step exchange procedure. 5 patients had implanted femoral components with wedge augmentation. Two patients had the femoral component implanted without augmentation. All had a tibial tray with a stem and 3 needed morsellized bone grafting.

Results: All patients have achieved a satisfactory result with good ROM. No patients have a flexion range below 110° and all have a good functional state with minimal pain. All knees were found postoperatively stable. There were no cases of re-revision.

Conclusion: We find that; in revision total knee arthroplasty, with bone loss and/or osteoporosis, using the Coordinate prosthesis is a good alternative. The patients are regaining a good state of mobility and have acceptable pain relief.

Incidence of total knee replacement in Denmark 1991–1995

N Levi, S E Østgaard and B Lund

Department of Orthopedic Surgery and Danish Knee-arthroplasty Register, Rigshospitalet, Copenhagen, Denmark

Total knee arthroplasty is being used increasingly for the treatment of advanced knee joint disease. However, the incidence of total knee replacement operations performed in Denmark has not been previously reported. The aim of this study was therefore to assess the incidence of total knee replacement in Denmark.

Patients and methods: Data were obtained from the Danish Board of Health and from a questionnaire to all departments of orthopedic surgery. All primary total knee replacements in Denmark were recorded between 1991 and 1995. The type of knee replacement (cemented, uncemented and hybrid) was also recorded. The total Danish population was 5.2 millions according to information obtained from the Danish central Bureau of Statistics.

Results: The mean age of the patients was 70 years (17–93) years. The incidence increased from 31 per 100,000 persons in 1991 to 44 per 100,000 in 1995. The number of total knee replacements in given below. The relative number of uncemented arthroplasties decreased from 1991 to 1995 whereas the relative number of hybrid arthroplasties increased.

	1991	1992	1993	1994	1995	TOTAL
Cemented	1101	1101	1251	1257	1632	6342
	68%	76%	73%	69%	72%	72%
Uncemented	432	275	339	356	318	1720
	27%	19%	20%	19%	14%	19%
Hybrid	75	70	130	207	314	796
	5%	5%	7%	11%	14%	9%
TOTAL	1608	1446	1720	1820	2264	8858

Discussion: The annual incidence of primary total knee arthroplasty in 1988 in Finland was 25 per 100,000 inhabitants. In Sweden the incidence increased from 12 per 100,000 inhabitants in 1980 to 57 per 100,000 inhabitants in 1992. Our incidence was somewhere inbetween. However, a higher incidence of 70 per 100,000 in Minnesota, USA was found in 1986.

References

Paavolainen P, Hamalainen M, Mustonen H, Slatis P. Registration of arthroplasties in Finland. Acta Orthop Scand 1991; 62(Suppl 241): 27-30.

Knutson K, Lewold S, Robertsson O, Lidgren L. The Swedish knee arthroplasty register. Acta Orthop Scand 1994; 65(4): 375-86.

Quam JP, Michet CJ, Wilson MG, Rand JA, Ilstrup, DM, Melton LJ, Wallrichs SL. Total knee arthroplasty: a population-based study. Mayo Clin Proc 1991; 66: 589-95.

ANKLE/FOOT

Outcome in 80 consecutive ankle arthroscopies

S Rasmussen and B N Laoutliev

Department of Orthopedic Surgery, Hvidovre Hospital

The purpose of this study was to review a series of consecutive ankle arthroscopies performed using current standard technique without distraction, and to assess the benefits and risks of the procedure.

Material and methods: From 1994 to 1996, 80 consecutive ankle arthroscopies were performed in 29 women and 47 men. Median age was 34 (17–62) year. Each patient had general anesthesia. No prophylactic antibiotics were given. The anterolateral portal was used for initial placement of the

arthroscope. The anteromedial portal was initially used for diagnostic probe or shaver. If necessary the posterolateral portal was used. The diagnoses were 56 anterior soft tissue impingements or synovitis, 29 anterior bony impingement, 17 chondral lesions, 13 loose bodies, 6 osteoarthroses and 2 rheumatoid arthritis. In 10 cases no operative arthroscopy was performed. Data were collected preoperatively and at 2 month follow-up. Pain was graded none = 1, minor = 2, moderate = 3 and severe = 4. The patients were asked to grade the result as excellent, good, fair and failure and if they would undergo the procedure again.

Results: In those ankles where operative arthroscopy was performed 48/70 benefited and became symptomfree. When diagnostic arthroscopy was performed 3/10 became symptomfree. Pain was reduced from 2 (0–4) to 0 (0–3). Excellent and good was graded in 72 cases, fair in 4 and failure in 4 cases. Knowing the outcome of the procedure 5 patients would not undergo the same procedure again. There were 3 deep infections from operative ankle arthroscopy and 1 synovial fistula in this series. The deep infections responded well to arthroscopic synovectomy and intravenous antibiotics. No persistent symptoms were recorded. There were no neurological complications.

Conclusion: The complication rate in our series was 4/80. The complications were major. However, they did not cause any persistent symptoms. Damage to the portal sites can be the cause of infection. Operative ankle arthroscopy yields good results, but there is a risk of infection.

Asepsis in ankle arthroscopy

S Rasmussen[1] and L Lintz Christensen[2]

Depts. of [1]Orthopedic Surgery and [2]Clinical Microbiology, Hvidovre Hospital

Over a 3-year period we performed 80 ankle arthroscopies and experienced 3 cases of deep infections with staphylococcus aureus. Chlorhexidine was used as an aseptic. No prophylactic antibiotics were given. The deep infections responded well to arthroscopic synovectomy and intravenous antibiotics. In order to determine the cause we conducted a study to measure the effectiveness of the aseptic procedure and whether using Iodine or Chlorhexidine makes a difference.

Material and methods: We asked 10 healthy subjects to participate. Standard operating room setup was performed and each ankle were draped for arthroscopy. The ankles were randomly allocated to asepsis by application of Chlorhexidine 2 mg/ml in 70 v/v % ethanol or Iodine 2.5 mg/g in 83 g % ethanol twice. At the topical place of the anterolateral portal bacterial grafting was obtained after 0, 15, 30 and 45 minutes after the aseptic procedure was performed. Operative arthroscopy was simulated by application of a saline cloth and rubbing the skin while obtaining the bacterial graft.

Results: Bacterial cultures were found in 6/40 grafts using Iodine and 3/40 grafts using Chlorhexidine. The cultures were found in grafts after median 30 (0–45) min. There were found 5 staphylococcus epidermidis, 2 coagulase negative staphylococcus and 1 non-hemolytic streptococcus in the Iodine group. In the Chlorhexidine group there were 3 coagulase negative staphylococcus and 3 staphylococcus epidermidis. Ambustio of first degree by Iodine lasting more than 1 week was observed in 4 subjects and at a total of 9 complained of irritation of Iodine.

Conclusion: We are surprised that the incidence of bacterial culture is 8 (3–18)% using Chlorhexidine and 15 (5–25)% using Iodine. We are considering the use of prophylactic antibiotics in ankle arthroscopy.

Ankle arthrodesis with the Ilizarov technique

A Godballe Lorentsen, J Schultz Hansen and R Weeth

Department of Orthopedic Surgery, Odense University Hospital

The Ilizarov technique represents a rather new possibility in arthrodesis of the ankles, and is applied in some difficult cases. The aim of this study was to evaluate the use of this technique in ankle arthrodesis.

Material and methods: In the period 1992–1996, arthrodesis was performed in 13 ankles by using Ilizarov technique. The operations were made by open surgical technique. Median age was 50 (28–77) years. There were 4 cases of posttraumatic arthrosis, 3 cases of rheumatoid arthritis, 3 cases of infected fractures of the malleoli, 2 of failed ankle arthrodesis, and 1 case of purulent arthritis with cartilage destruction. 3 patients had lengthening of the tibia as part of the treatment. 1 patient dropped out during the treatment.

Results: The median time of fixation with Ilizarov was 126 (55–150) days. Pin infections were noted in 7 cases and 3 K-wires broke in 2 patients. 1 patient needed surgical revision of the pinholes after the Ilizarov apparatus had been removed. 10 patients had a solid arthrodesis, and 2 had nonunion of the arthrodesis. Of the 10 healed arthrodeses, 7 had no pain, and 3 had mild pain. Of the 2 non healed arthrodeses, 1 had mild pain and 1 is waiting for re-arthrodesis. All 3 cases of proximal tibial lengthening healed.

Conclusion: The Ilizarov fixator is a valuable tool in treating difficult cases of ankle diseases needing arthrodesis. The technique can be used in spite of the presence of infection at the time of operation, and it allows proximal lengthening combined with compression of the fusion site.

Early results of combined Turco procedure and closing wedge cuboid osteotomy for the treatment of residual or achieved clubfoot

N Ellitsgaard and S Sonne-Holm

Department of Orthopedic Surgery, Hvidovre Hospital, Denmark

Evaluation of the early outcome of combined soft tissue release and closing wedge cuboid osteotomy for the treatment of residual or achieved pes equinovarus adductus. This surgical procedure was introduced in our department March, 1996.

Material and methods: 5 feet in 5 patients were included. All patients had undergone previous extensive soft tissue release procedures and the operation was performed because of residual idiopathic clubfoot in four patients and achieved clubfoot with severe forefoot adduction in one patient with cerebral palsy. The operation was performed at a median age of 5 (4–6) years. The procedure was performed as a complete posteromedial and plantar release a.m. Turco through a Cincinnati incision and a closing cuboid wedge osteotomy through a separate lateral incision After reduction of the mid- and forefoot the mid-tarsal joint and the osteotomy were fixated with pins. In two feet the anterior tibial tendon were transferred laterally. The pins were removed after 6 weeks casting. A follow-up was done after median 9 (3–11) months. All patients were assessed by three dimensional spiral CT-scans, in 2 cases a prototype was used in preoperative planning.

Results: The patients were discharged after 2 (1–4) days. All osteotomies healed primarily. No infections were seen. At follow-up normal gait was seen in the patients with idiopathic clubfoot, their heels were plantigrade, dorsiflexion 10 degrees and the forefoot adduction corrected. The child with cerebral palsy showed full weight bearing in a walker without pain, his foot plantigrade in an ankle-orthosis.

Conclusion: Extensive posteromedial and plantar release combined with a closing wedge cuboid osteotomy appears to be an adequate method of treatment for residual or achieved clubfoot. The osteotomy corrects the long lateral column of the foot, it preserves the tarsal/metatarsal joints and does not produce the long-term stiffness of the hindfoot seen after calcaneocuboid arthrodesis.

The effect of extensor digitorum brevis transfer for chronic lateral ankle instability

S Kaalund, S Vammen, L G Pedersen and T Ejsing

Department of Orthopedic Surgery, Randers Hospital

The purpose of this study was to evaluate the effect of extensor digitorum brevis transfer for chronic lateral ankle instability.

Material and methods: During the years 1980 to 1994, 38 patients answered a questionnaire, concerning the result of their operation. In 32 of the 38 patients a clinical examination was performed along with exercises on a teeter dishboard, running in circles and active and passive EMG measurements on musculus extensor digitorum brevis.

Results: The results from the questionnaire disclosed that 90% of the patients with observation time of 9 (1.4–14) years were content postoperatively; in 96% of the patient the number of distorsions was considerably reduced.In athletic patients with more than 4 hours of sport per week activities, 42% resumed their activity at the same level.

The objective examination revealed that the duration of time on the teeter dish was reduced 25% in the operated foot compared with the uninjured.

The time difference in runnig in circles with the operated foot facing the center increased 8%. EMG activity was found in musculus extensor digitorum brevis during active motion of toes as well as at passive supination of the ankle joint, but not during passive pronation of the ankle joint.

Conclusion: The effect of the extensor digitorum brevis transfer offers an enhancement of the lateral stability of the ankle joint; however, it also seems to enhance the proprioceptive protection against distorsions.

Fracture of the fifth metatarsal

T Ringstrøm Nielsen, B Erling Lindblad and P Faunø

University Hospital of Århus, Dept. of Orthopedic Surgery

The aim of this retrospective study was to evaluate the frequency of long term complications after isolated fracture of the fifth metatarsal, treated conservatively.

Material and methods: During the period of Dec. 1987 to June 1990, 182 patients with 183 isolated fractures of the 5th metatarsal were treated at Århus Amtssygehus.In this study, patient files were reviewed and questionnaires were send to the patients inquiring about sequela from the fracture, if any.

Radiographs were re-examined and classified into the following groups:A) Fracture through the tip of tuberositas. B) Fracture going to the articulation between the fifth metatarsal and os cuboideum; C) going to the articulation between the fourth and the fifth metatarsal; D) in the level of the distal limit of the joint or just beneath; equivalent to Jones' fracture; and E) including all distal fractures (corpus, collum and caput). According to the classification, the fractures were distributed as follows: A: 9%, B: 41%, C: 10%, D: 10% and E: 30%. The average age was 32 (8–81) years, and mean follow-up time 95 (78–109) months.

Results: 114 patients, with an equal sex distribution, returned the questionnaire (62%). 43 patients (38%) had complaints from the foot in a period after treatment, but at follow-up 18 of 118 complained of present problems. The percentage of patients with persistent complaints in the different fracture groups varied between 8 and 30%, with group D (Jones' fracture) having the highest percentage. 4 had instability problems (4%), 2 had work restrictions, 4 had restrictions to sports activity due to the fracture, and 3 restrictions in leisure time. No proliferation were found for any fracture subgroup.

Conclusion: Surprisingly, 43 patients reported symptoms after end of treatment. At follow-up 18 of 114 had persistent problems. In the group of Jones' fractures (D), 30% of the patients reported persistent problems from the foot. This type of fracture is often reported being in the high risk zone for fracture sequela, often due to delayed or non-union. Our data support the opinion, that when dealing with Jones' fracture, one should be aware of the possibility of long-term complications.

Trauma

Spiral computed tomography in potentially multitraumatised patients

T Bæk Hansen[1], B Bojsen[1] and M Persson[2].

Depts. of [1] Orthopedics and Traumatology, and [2] Radiology, Holstebro Central Hospital, Denmark

Aim of the study was: 1) to evaluate spiral computed tomography as a screening for lesions in potentially multitraumatized patients as part of a trauma protocol in a trauma care system, and 2) to investigate the use of this type of screening in Denmark. Design: descriptive, retrospective study of patient case records combined with a questionnaire.

Material and methods:

1. All potentially multitraumatized patients admitted to Holstebro Central Hospital in the period April 1 1993 to August 31 1996, where spiral computed tomography was performed as part of a trauma protocol as a screening for lesions —42 patients with a median age of 28 (2–79) years, 32 men (76%) and 10 women (24%).

2. Questionnaire to all hospitals in Denmark with round the clock admission of potentially multitraumatized patients —83 hospitals.

Methods: 1. All case records concerning the 42 patients were evaluated and all lesions were recorded together with the lesions found at the spiral computed tomography. The lesions were classified according to the AIS system, and the ISS (injury severety score) was calculated for all patients.

2. The questionnaire asked, if spiral computed tomography was available at the hospital, and if it was used for potentially multitraumatized patients as a screening procedure.

Results: 1. The spiral computed tomography: Median ISS was 16 (9–43). Five patients (12%) died of the lesions (ISS 18–43). There was a total of 122 lesions found at computed tomography of the 42 patients (2.9/patient). In 7 patients (17%) no lesions were found at the computed tomography. In 6 patients the only lesion found at computed tomography was pulmonary contusion, and in 2 patients there were only minimal lesions (fracture of one rib, small avulsion fracture from the acetabulum). In the remaining 28 patients (65%) there was an average of 4,1 lesions/patient.

2. The questionnaire: 76 hospitals (92%) answered the questionnaire. 35 hospitals (46%) had the possibility of doing a spiral computed tomography in potentially multitraumatized patients, but only 4 hospitals (9%) performed this screening in potentially multitraumatized patients.

Conclusion: Based on our findings, we recommend spiral computed tomography as a screening procedure in potentially multitraumatized patients. It is a non-invasive technique, that rapidly gives information of hidden lesions, improves diagnostics on other lesions and enables diagnostics of intracranial lesions.

At the moment, this technique has not gained popularity in Denmark, but we recommend hospitals with possibilities for this screening procedure to consider the future use of spiral computed tomography in potentially multitraumatized patients.

Results of late surgical treatment of pelvic ring nonunion and malunion

D Blohm, F Madsen and J Jensen.

Department of Orthopedics, Aarhus University Hospital

Formerly fractures of the pelvic ring were considered fractures which always unite. Non-union (NU) and mal-union (MU) of the pelvis is a condition of imperfect or displaced healing of previous fracture of the pelvic ring. The cause of the condition is to be found in primarily inappropriate conservative or inadequate surgical treatment of unstable fractures of the pelvic ring. Long-term symptoms of NU and MU are severe and disabling and include chronic pain, instability, gait problems, leg length difference and sitting problems. Late reconstruction of pelvic ring NU and MU is technically much more demanding than surgical treatment of acute pelvic ring fractures. Operative complications are persisting NU, nerve and vascular lesions, absence of pain alleviation, infection and unsuccessful reduction of the NU or MU. To prove any connection between the clinical findings and the symptoms of the patient a detailed clinical and radiological examination ahead of surgery is essential.

Materials and methods: From Nov. 1991 we treated 10, primarily referred, cases of NU and/or MU. 2 women and 8 men averaging 34 years of age at the time of injury. Average time from injury to referral was 33 months. Initial treatment was conservative (7), internal fixation (2) or combined internal and external fixation (1). The major complains were anterior and/or posterior pain (10), limp (7), leg length difference (6) and sitting problems (7).

Results: After an average of 15 (2–24) months of postoperative observation all apart from one (the latest operated) showed radiological union, 4 had no pain at all, 5 claimed pain relief, and 1 claimed no relief. All 7 with a preoperative limp claimed improvement or complete restitution. 2 out of 6 still had a minor leg length difference (less than 1.5 cm), which was corrected by shoe support. 2 claimed only little relief of the sitting problems.

Conclusions: We find that, if a patient has severe disabling symptoms that are related to NU and/or MU, the patient can expect an improvement of the symptoms by late correction surgery of the pelvic ring deformity.

Popliteal artery injury after lower limb trauma

A Fricke and S Larsen

Odense University Hospital, Department of Orthopedic Surgery, Odense, Denmark

Trauma victims with manifest evidence of vascular injury such as ischemic leg and foot are usually diagnosed immediately. A vascular injury without manifest symptoms or clinical findings is much more difficult to diagnose. Contrast angiography has been the diagnostic tool for the last decade. Doppler arterial pressure measurement has proved to be a reliable method.

The purpose of our study is to investigate mechanisms of trauma and diagnostic procedures to avoid amputation.

Material and methods: From January 1985 to December 1994, 17 patients with lower limb trauma and popliteal artery injury were treated in the departments of vascular and orthopedic surgery. In this retrospective study all but one patient were operated. Mean age was 24 years. 13 were men, and 4 were women. 2 patients had multiple trauma, 1 of these died of shock.

Results: 4/17 patients had penetrating trauma, and 13 patients had a blunt trauma and all of these high energy traumas. Types of accidents were road traffic accidents, fall from high level, and crush trauma against the popliteal fossa. All 17 patients with popliteal artery injury had additional lesions in the knee region. 11 patients had fractures in the knee region, but only o1 ne caused a popliteal lesion. 6 patients had a luxation of the knee joint. 11/17 patients had lesions of n. peroneus. 7 patients had their arterial lesions diagnosed more than 8 hours after the accident, and 2 of these had their leg amputated.

Conclusion: To avoid ischemic injury of the lower leg it is essential to diagnose a traumatic popliteal artery lesion within 6–8 hours. High energy trauma to the lower leg should increase the suspicion of popliteal artery lesion.

Residual impairment 6 months following lower extremity fracture

C Færgemann, P A Frandsen and N D Röck

The Accident Analysis Group, Department of Orthopedic Surgery, Odense University Hospital, Denmark

The aim of this study was to elucidate the impairment and disability 6 months after unilateral fracture of the lower extremity.

Material and methods: Included in the study were 158 consecutive patients admitted to the Department of Orthopedics, Odense University Hospital with unilateral lower extremity fracture. Patients with isolated phalangeal fractures were excluded. Patients were interviewed prior to discharge from hospital, in the out-patient clinic or by telephone within the first week after the trauma. All patients returned to the hospital for a second interview and a clinical assessment 6 months posttraumatically. The mean age was 42 years and 55% were men. 45% of the fractures were caused by a fall and 35%t of the patients were hospitalized.

Disability was measured by interview using the Sickness Impact Profile (SIP). SIP-scores were calculated pre- and posttraumatically. Additionally three major aspects of impairment were measured: range of motion, muscle strength and pain (VAS Pain).

Results: Most patients had a significant higher (poorer) SIP-score after 6 months than prior to fracture. The mean overall SIP-score was 2.7 pretraumatically and 8.7 six months posttraumatically. Major deficits in range of motions were observed, mainly in the ankle joint. Additionally, loss of muscle strength was observed in the thigh or calf muscles in 20% of the patients. Only low levels of pain were reported.

Conclusion: The rise in SIP-score indicated a moderate rise in level of disability after 6 months representing dysfunction across several domains in everyday living. Secondly, we demonstrated moderate degree of loss in muscle strength and range of motion.

Expectations of the long-term outcome following a tibial shaft fracture

C Færgemann, P A Frandsen and N D Röck

The Accident Analysis Group, Department of Orthopedic Surgery, Odense University Hospital, Denmark

The aim of the study was 1) to disclose expectations of the long-term outcome of an unilateral tibial shaft fracture in 5 different socio-economic groups and 2) to compare these expectations with the actual long-term outcome measured in patients.

Material and methods: In the study 207 laymen and professionals answered a questionnaire regarding their expectations of the outcome 6 months following a unilateral tibial shaft fracture. The 5 groups were: I) 42 orthopedic surgeons, II) 36 physiotherapists, III) 42 students, IV) 49 white collar workers and V) 38 blue collar workers. The expected outcome was measured by Sickness Impact Profile (SIP). Each person answered a questionnaire about the expected outcome and SIP-scores were calculated for each person. The SIP-scores were compared with SIP-scores obtained from 33 patients with a unilateral tibial shaft or distal tibial fracture 6 months after the fracture.

Results: Marked variation was registered between the 5 socio-economic groups. Physiotherapists expected the lowest degree of disability and orthopedic surgeons the highest. In the 3 groups of students, white and blue collar workers major agreement was observed and their SIP-scores showed good correlation to the SIP-scores obtained from the patients.

Conclusion: The study demonstrated marked variation between the 5 socio-economic groups. Physiotherapists underestimated the degree of disability and orthopedic surgeons overestimated the degree of disability 6 months after the trauma.

Is the number of lower extremity amputations still decreasing?

N Ellitsgaard[1], B Bornefeldt Olsen[2], A Philipsen[3] and V Ellitsgaard[4]

[1] Department of Orthopedic Surgery, Hvidovre Hospital
[2] Department of Orthopedic Surgery, Bispebjerg Hospital
[3] Department of Orthopedic Surgery, Sundby Hospital and
[4] Department of Surgery, Bispebjerg Hospital, Denmark

During the last fifteen years all candidates for major lower amputation due to vascular insufficiency in Copenhagen have been assessed for vascular surgery prior to amputation. New revascularisation techniques have been developed resulting in decreasing numbers of cases ineligible for vascular surgery, which in its turn has decreased the number of amputations performed, a tendency which is also reflected in the nationwide surveillance by the Danish Amputation Register. From the early eighties up to 1990 the number of major amputations decreased by about 30 percent due to the introduction of bypass to infra-popliteal arteries. As vascular surgery units now report on further reductions in amputations after revascularisation-procedures to pedal arteries the authors have registered all major amputations performed in the three community hospitals covering the region of referral to the vascular surgery unit at Bispebjerg Hospital in order to assess the trend.

Material and methods: From 1991 to 1994, 477 major lower extremity amputations were performed at the Copenhagen community hospitals, serving a population of 373,000 inhabitants. 432 amputations caused by vascular insufficiency were done in 172 cases of diabetes and 260 cases of arteriosclerosis. 158 patients had had vascular surgery before amputation. The chi-square test was used for calculating differences, with $P < 0.05$ considered significant.

Results: During the period we found a non-significant decrease in the number of amputations for vascular disease as a whole and in arterosclerotics. In diabetics the number was however reduced from 48 to 28 cases from 1993 to 1994. No difference was found between independent patients still living in their homes and chronic ward patients, the latter rarely feasible for limb salvage surgery. In 91/92 independent patients amputated after vascular surgery had a highly significant risk of loosing an amputation level compared to 93/94 where the risk was just significant.

Conclusion: Although still declining amputation rates seem higher than estimated by some centers. The establishment of a diabetes foot center in 1993 might have a positive impact on the risk of amputations in diabetics.

Registration of postoperative pain in the acute pain service clinic at HovedOrtoCentret

E Jansen, P A Christensen, V Feilberg, M Kjær, O Madsen and P R Nielsen

The Anesthetic Department, HovedOrtoCentret, National Hospital, Copenhagen

The postoperative pain treatment is now considered an important factor concerning anesthesia and surgery. A new routine was started, where the acute pain service, anesthetic department, Copenhagen University Hospital, Denmark, daily visited all postoperative patients in the orthopedic department. This meant that an increasing number of electively and acutely operated patients were seen. The pain treatment for all postoperative patients was optimized regarding visiting patients in pain, standardizing pain instructions and carrying out instructions. The applied tool is considered useful in clinical quality assurance.

Material and methods: All patients are included in a computerized booking system, and the patient data are transferred from this to a registration system. In the registration system patients are given a personal bar code. After that, a questionnaire is printed for each patient. A VAS score at rest less than 4 and at mobilization less than 6 was considered adequate treatment. At the daily rounds, the pain treatment is adjusted and the question forms are filled in. All data are read with the use of a laserpen connected to the computer. Using bar codes secures correct and easy recording. Statistical transcripts of the latest treatment results, is part of the material used for weekly quality meetings.

Results: At the one year evaluation, children and adults were evaluated separately. 86 children and 514 adults were seen. Of these 22% received an epidural pain treatment, 7% were treated with PCA electric pump, 3% with PCA Baxter watch, while 68% were treated with oral medicine. Median VAS at rest was 3.3 (1–10). Median VAS score mobilized was 4.6 (1-10), and worse VAS during previous 24 hours 6.0 (1–10). 39% of the patients were not adequately painrelieved, with a VAS at rest higher than 3. Likewise 38% of the patients were inadequately treated with a VAS score higher than 5. Other considerations were mobilization postoperatively and side effects directly related to morphine and satisfaction with treatment.

Conclusion: During the year, reporting has lead to several further developments in pain treatment in the department. A specific pain protocol has been written for all operation methods, and a prescription form has been printed to be used for all anaesthetized patients, which is filled in together with the anesthetic chart. Every patient is secured an individual postoperative pain-treatment. The daily pain rounds will in the future include all postoperative patients in the center. A weekly pain meeting is hold, where all involved in the development of pain treatment and those involved in the clinical work are gathered together. At this meeting the previous week pain treatments are discussed and improvements evaluated.

BASIC SCIENCE

Resorption of hydroxyapatite and fluorapatite coatings in humans—an experimental study in trabecular bone

S Overgaard, K Søballe, M Lind and C Bünger

Biomechanics Laboratory and Spine Section; Department of Orthopedics, Stereological Research Laboratory, University Hospital of Aarhus, Denmark

Hydroxyapatite (HA) coatings have proven to enhance implant fixation, experimentally and clinically compared to uncoated metal implants. However, the clinical use of HA coat-

ing remains a controversial issue, especially due to concerns of the long-term performance of the coating and to the effects of resorption. Fluorapatite (FA) has recently been introduced as a more stable ceramic coating than HA but has not been studied in humans. The aim of this study was to evaluate the osteoconductive properties of HA and FA coatings in humans, and to quantify resorption of these coatings during a one year implantation period in trabecular bone.

Patients and methods: 15 patients suffering from an acute spinal fracture, which was stabilized by internal fixation (pedicle screw implants and rods) and ostero-lateral fusion, were included in a prospective study. Each patient had 2 implants, coated with either HA or FA, inserted into the iliac crest. The implants were initially surrounded by a 1 mm gap and were harvested 13.6±0.6 months after surgery. The study was approved by the Medical Ethics Committee and informed consent was obtained from each patient before surgery.

Results: Histological evaluation demonstrated that bone ongrowth to HA-coated implants was 78.7±11.1% compared with 60.8±9.8% for FA-coated ($p<0.001$). FA-coated implants had 2-fold more ongrowth of fibrous tissue ($p<0.01$). The overall coating thickness of HA was significantly reduced by 18% and by 17% for FA (NS) compared with non-implanted controls. The HA coating was significantly thicker than FA (62.3±2.2 mm vs 59.0±1.9, respectively) when bone was present on the coating surface. When bone marrow was present, the HA coating was significantly thinner than the FA coating (39.3±9.9 mm vs. 53.9±2.4 mm). The difference in coating thickness when covered by bone or bone marrow was 23.1±9.7 mm for HA and 5.1±1.7 mm for FA ($p<0.01$), suggesting that FA is more stable than HA against resorption by bone marrow. No difference regarding bone volume in the gap was found. No coating delamination and no adverse reaction in the surrounding bone were shown.

Conclusion: It is suggested that in humans, the osteoconductive properties of HA coating are superior to those of FA coating. Resorption rates for both coatings were approximately 1/5 of the coating thickness per year which most likely are minimum figures for the clinical situation. It is suggested that bone ongrowth reduce resorption whereas bone marrow seems to accelerate resorption particularly at the HA coating.

Sealing effect of hydroxyapatite coating on peri-implant particle migration

O Rahbek[1,2], S Overgaard[1,2], M Lind[1,2], K Bendix[3], C Bünger[1,2], K Søballe[1,2]

[1] Biomechanics Laboratory,
[2] Institute of Experimental Clinical Research,
[3] Institute of Pathology, University Hospital of Aarhus, Denmark

Aseptic loosening of non-cemented hip replacements is a common reason for revision surgery. Wear debris from the articulating surfaces, especially polyethylene particles, are believed to produce osteolytic lesions around the components by activating macrophages. Sealing off the bone-implant interface from the joint space seems therefore to be of great importance to prevent migration of wear debris. Aim: To analyze whether a hydroxyapatite (HA) coating is more resistant to polyethylene (PE) particle migration than a non-HA-coated implant in a weight-loaded dog model.

Materials and method: Cylindrical titanium alloy implants with sand-blasted surface were used. Two implants were inserted in each knee of 8 Labrador dogs. One implant was implanted in each femoral condyle with a peri-implant gap communicating with the joint space. A HA-coated and a non-HA-coated implant were randomly allocated to medial or lateral condyle. Three weeks after surgery PE-particles (mean-size: 2.0 mm) were injected into the right knee joint. The injections were repeated weekly until the animals were terminated 8 weeks after surgery. Histological examination of the bone-implant specimens included histomorphometry and demonstration of PE-particles by Oil Red O and polarized light. Statistics. Presented as means with standard error of the mean. Paired or unpaired t-test was used. P-values less than 0.05 (two-tailed) were considered significant.

Results: All non-HA-coated implants were surrounded by a fibrous membrane with a lining of synovial like cells opposed the implant, whereas all HA-coated implants were anchored by bone.

Particle migration. Great amounts of PE-particles were demonstrated along the entire length of non-HA-coated implants in the PE-particle injected knees. Very few PE-particles were found around the HA-coated implants.

Tissue-ingrowth. There was no difference in ingrowth between implants from PE-particle injected knees and non-PE-particle injected. Bone-ingrowth differed significantly ($p<0.01$) between HA implants and non-HA-coated implants (36 (1.9) % vs. 1 (0.4) %) and so did ingrowth of fibrous tissue (6 (1.9) % vs. 89 (5.2) %).

Conclusion: The present study suggests, that HA-coating is able to inhibit peri-implant PE-paricle migration, by creating a seal due to enhanced bone ingrowth.

Calcitonin gene-related peptide increases cortical and cancellous bone blood flow in pigs

B E Lindblad, L B Nielsen, S Jespersen, C Bünger and E S Hansen

Department of Orthopedics and Institute of Experimental Clinical Research, University of Aarhus, Denmark

Four different neuropeptides have been discovered in bone: calcitonin gene-related peptide (CGRP), vasoactive intestinal peptide, substance P, and neuropeptide Y. CGRP is a systemic circulating hormone, but acts as a neuropeptide in both the central and peripheral sensoric nervous system. CGRP stimulates cAMP formation in osteoblast cultures and inhibits PTH and PGE_2 induced calcium release from cultured bone, indicating inhibition of bone resorption. Furthermore,

CGRP accumulates in experimentally fractured rat tibiae. CGRP induces vasorelaxation in the arterial bed of the porcine nutrient artery. The purpose of the study was to investigate the effect of CGRP on regional bone blood flow in vivo.

Material and methods: Animals 6 pigs of both sexes, 55–62 kg, were used.

Experimental model: The nutrient artery of one tibia was catheterized and supplied with autologous blood from the left carotid artery at constant rate through a peristaltic infusion pump. The tibial bone perfusion pressure (BPP) was recorded. Regional bone blood flow (RBF, mL/min/100g) was estimated using the serial radiolabelled microsphere technique. The first microsphere injection was performed 30 min. after steady state b allowing microspheres through the circuit driven by the pump. The second microsphere injection was performed after the perfusion pump had been disconnected and the tibia was fed by arterial blood driven by the systemic arterial pressure (autoperfusion). The third microsphere injection was performed while the extracorporeal circuit was switched to a parallel tube containing autologous blood with $1x10^{-7}$ M of CGRP (autoperfusion + CGRP). The pump perfusion was reestablished for 30 min. after each microsphere injection. This enabled assessment of the effect of CGRP on the RBF and the effect of shifts between pump- and autoperfusion on the RBF and BBP. The order of the microspheres and the type of perfusion were random.

Results: Total blood flow of the autoperfused tibia was lowered 6-fold compared to that of the pump-perfused tibia (i.e. $RBF_{auto} / RBF_{pump} = 0.17$, $p<0.01$). This difference was found in diaphyseal and metaphyseal bone ($p<0.05$), as well as in the periosteum ($p<0.001$). No differences were found in the proximal epiphysis, in the distal epiphysis, or in extraperiosteal tissue. Infusion of $1x10^{-7}$ M CGRP increased the tibial bone blood flow two-fold (i.e. $RBF_{auto+CGRP} / RBF_{auto} = 2.17$, $p<0.05$). CGRP infusion resulted in a significant increase in RBF of both epiphyses, both metaphyses, and diaphysis. Diaphyseal cortex and marrow, metaphyseal cortex and cancellous bone, and epiphyseal cortex and marrow received a significantly higher blood flow during infusion of CGRP. The effect of CGRP on RBF was greater in the proximal metaphyseal cortex and cancellous bone than in the diaphyseal cortex and marrow and the distal metaphyseal cortex and cancellous bone. No increase was seen in RBF of the periosteum and extraperiosteal tissue during CGRP infusion. Overall, the diaphyseal marrow and metaphyseal cancellous bone received a higher blood flow than their respective cortical areas.

Discussion and conclusion: CGRP has a vasodilatory effect in bone in vivo resulting in an increase in bone blood flow of both cortical and cancellous envelopes of metaphyses as well as the diaphysis. The findings emphasize that local neurosecretion of CGRP might contribute to vasoregulation in bone in addition to a possible involvement of this neuropeptide in bone metabolism. CGRP might be of importance for the regulation of bone blood flow during ischemic conditions, e.g. osteonecrosis and fracture healing.

Expression of CD18 and CD11a,b in the rabbit synovial membrane after injection of polyethylene particles

C Tørring[1], M Lind[2], S Overgaard[2] and B Deleuran[1]

Depts. of [1]Rheumatology and [2]Orthopedics[2], Aarhus University Hospital

Polyethylene particles (PEP) released from endoprosthetic components have been suggested to participate in the formation of osteolysis and implant loosening. Recruitment of inflammatory cells are involved in this process. Leukocytes can only migrate and accumulate if they express adhesion molecules. We therefore examined the expression of the leukocyte adhesion molecules LFA-1 by studying its components CD11a,b, and CD18.

Method: Rabbits (n=6) were injected weekly in the right knee with 1 ml of PEP suspended in a hyaluronic acid/phosphate saline buffer (approximately 7 billion particles, average size of 7 μ) and in the left knee with buffer alone. Immediately postmortem both knee joints were opened and samples for immunohistochemical examination were snap frozen. CD11a,b and CD18 were detected by indirect immunohistochemical techniques. The tissues were evaluated by light microscopy.

Results: One rabbit died, leaving 5 rabbits for examination. None of these showed signs of pain or limping.

In the control joints the synovial membranes were normal, without signs of inflammation and only low expression of CD18 was observed.

In the joints injected with polyethylene particles the synovial membrane was characterized by a thick lining layer and moderate inflammation consisting of mostly mononuclear cells, judged to be monocytes. High expression of CD18 and CD11a together with low expression of CD11b was observed in the lining layer, especially around PEP.

Conclusion: We have shown, that polyethylene particles can induce expression of CD18, CD11a, and to some extend CD11b, thereby creating an important step in the inflammatory reaction, which could contribute to implant loosening.

Age-dependent variations in architectural properties of ovine trabecular bone

A Nafei, J Kabel, A Odgaard, F Linde and I Hvid

Biomechanics Laboratory, Aarhus University Hospitals, Aarhus, Denmark

The objectives of this study are to examine the age-dependent variations in the architectural properties of trabecular bone, and to illuminate their relationship to its mechanical properties.

Material and methods: Trabecular bone from the proximal tibia of lambs aged 3, 6, and 9 months (skeletally immature) and sheep aged 36 and 80 months. There were 10 animals in each group. One tibia for mechanical properties, contralateral tibia for architectural properties. The samples

were cut according to a standardized protocol. The compressive mechanical properties were reported on earlier (1). The architectural properties were determined using the method of serial sectioning and three-dimensional reconstruction (2).

Variables: Bone volume fraction (BV/TV), connectivity (CN), mean trabecular volume (MTV), bone surface density (BS/TV), architectural anisotropy (AA), elastic modulus (pa), ultimate stress (su), energy absorption to failure (Wu), and apparent density (pa). The architectural properties were compared in the skeletally immature and mature groups, and were correlated to both age and the mechanical properties.

Results: BV/TV, MTV, AA, E, su, Wu, and pa showed significant positive correlation with age, while CN and BS/TV showed significant inverse correlation with age. Comparing the skeletally mature and the skeletally immature groups we found that the skeletally immature group exhibits significantly lower BV/TV ($p = 0.002$) , significantly higher CN ($p< 0.0001$), significantly lower MTV ($p < 0.0001$), and significantly higher BS/TV ($p < 0.0001$). The degree of AA estimated as the largest diameter of the mean intercept length ellipsoid divided by its smallest diameter, increased with increasing age (ANOVA, $p = 0.0001$). BV/TV correlated significantly with E ($r = 0.63$, $p< 0.0001$), with su ($r= 0.69$, $p< 0.0001$), and with Wu ($r = 0.60$, $p< 0.0001$). A significant inverse correlation was found between E and CN ($r= -0.53$, $p = 0.0004$). None of the architectural variables significantly correlated with ultimate strain. There was a significant correlation between pa of samples taken from one tibia and the BV/TV of the samples taken from the contralateral tibia ($r= 0.83$, $p< 0.0001$). In a multiple regression model BV/TV together with MTV and BS/TV could explain 81% of the variations in E.

Conclusions: Architectural properties of trabecular bone differ significantly in accordance with skeletal maturity. Trabecular bone of skeletally immature individuals is less dense, contains a larger number of thinner trabeculae per unit volume, and is less anisotropic. The architectural properties significantly affect the compressive mechanical properties of trabecular bone. BV/TV, BS/TV, and MTV are the major variables that determine the compressive elastic modulus of trabecular bone. CN does not positively correlate with E as commonly perceived.

References

1. Nafei et al. Variations in mechanical properties... Trans ORS 1995; 20: 533.
2. Odgaard et al. A direct method for fast three-dim... J Microsc. 1990; 159: 335-342.

Miscellaneous

Treatment delay in osteosarcoma, chondrosarcoma and Ewing's sarcoma

N Levi, S E Østgaard and B Lund.

Department of Orthopedic Surgery, Rigshospitalet, Copenhagen, Denmark

Delay in referral of patients with primary malignant tumors of bone is frequent and has been reported in two Danish studies from 1977 and 1984. The aim of this study was therefore to evaluate the patient's as well as the doctor's delay in primary malignant tumors of bone in order to assess if this delay had diminished.

Patients and methods: During a period of 14 years (January 1983 to December 1996), 47 patients with chondrosarcoma, 45 patients with osteosarcoma and 17 patients with Ewing's sarcoma were treated at Rigshospitalet. The mean age of the 47 patients (32 women and 15 men) with chondrosarcoma was 54 (30–85) years. The mean age of the 45 patients (23 women and 22 men) with osteosarcoma was 26 (6–72) years. The mean age of the 17 patients (7 women and 10 men) with Ewing's sarcoma was 19 (3–33) years. The patient's delay was defined as the period from the first symptom or sign until the patient first consulted a doctor. The doctor's delay was defined as the period from the first visit to a doctor until admission to our department.

Results: The patient's and doctor's delay are given in Table 1:

Diagnosis	Number of patients	Patient's delay (months)	Doctor's delay (months)	Total delay (months)
Chondrosarcoma	47	25.7 (0–300)	4.7 (0–48)	30.4
Osteosarcoma	45	4.0 (0–24)	2.6 (0–24)	6.6
Ewing's sarcoma	17	4.2 (0–24)	2.9 (0–12)	7.1

Discussion: Dissing et al. (1977) reported a total delay of 6.6 months in the osteosarcoma group, 5.5 months in the Ewing group and 25.6 months in the chondrosarcoma group. Sneppen et Hansen (1984) reported a total delay of 6.4 months in the osteosarcoma group and 9.6 months in the Ewing group. Our results were similar suggesting no reduction in delay. The relationship between delay and prognosis is controversial because the most aggressive tumors may have a shorter delay.

References

Dissing I, Sneppen O, Heerfordt J, Schildt T. Patient delay and doctor's delay in primary malignant tumors of bone. A review of 100 cases. Ugeskr Læg 1977; 139:1283-1285.

Sneppen O, Hansen M. Presenting symptoms and treatment delay in osteosarcoma and Ewing's sarcoma. Acta Radiologica Oncology 1984; 23: 159-162.

Scapulae alatae treated by bracing and muscle training

T Klebe, M Breddam, C Jepsen, J Ferreira and G Aalkjær

Depts. of Orthopedics and Fysiotherapy, Viborg Central Hospital.

Scapula alatae (angle wings) is characterized by paresis/paralysis of m.serratus anterior, innervated by n. thoracis longus. This investigation reveals the results after bracing and muscle training in patients suffering from scapula alatae.

Material and methods: 8 patients, 5 men and 3 women with a mean age of 39 (25–69) years were treated with bracing and muscle training. The purpose of the brace is to retain scapula in its proper place allowing for stretching of the rhomboids and pectoralis major and strengthening of the middle and inferior trapezius muscle.

In this way the scapula is in its proper position and the length of the muscles is corrected, so that when/if n. thoracis longus regains its function, m. serratus anterior is allowed to contract from a normal position and hereby obtaining faster return to normal activity.

One patient had previously been operated by transposition of m. pectoralis minor to scapula and with fascia lata transplantation, but with no relief of symptoms.

Results: Prior to bracing all patients suffered from shoulder pain, shoulder fatigue and limited range of motion, and they also had cosmetic complaints.

At the time of the investigation 5 patients had stopped using the brace after an average of 8 (7–10) months. They had returned to full activity, had no complaints, no visible scapula alatae and were very satisfied with the treatment. 3 patients were still in training. Their scapula was still not entirely in place when unbraced, but they all felt their symptoms had diminished a lot, they tolerated the brace well and were very satisfied with the treatment.

Conclusion: Although only tested on 8 patients, it seems that the combination of bracing and muscle training is successful in treating scapula alatae. It can not be concluded whether the good results are due to full recovery of the serratus anterior muscle, or whether the other muscles to a smaller or larger extend have compensated for a weak/not functioning m. serratus anterior, as EMG has not routinely been performed.But all patients who have completed treatment have good functional results and the 3 patients still braced are experiencing considerable improvement.

Orthopedic satellite function—an inquiry

N Krarup Jensen

Department of Orthopedics, Viborg Hospital.

Based on our own good experiences with an orthopedic satellite function, we found it of interest to illuminate the extent of orthopedic satellite function in Denmark.

Material and methods: 45 questionnaires were sent to orthopedic departments, or surgical departments with an consulting orthopedic, 43 departments answered.

Results: 12 departments had established a satellite function, 10 departments were considering or had already planned a satellite function, in 4 cases the plans were to take effect within a year or two. 21 departments had not considered establishing an orthopedic satellite function. Among the 12 departments with a satellite function, 2 had no operating facility. The remaining 10 departments can be divided into four groups: 1) hospitals where establishing the satellite function was a part of a larger reorganization in the county, 2) satellite function on a smaller neighbor hospital where surgery only was performed on an out-patient basis, 3) satellite function where practically all types of planned orthopedic surgery were performed, both on in-patients and out-patients, and 4) one hospital operating only on patients with slipped disc one day a week. A total of 9046 operations were performed in the satellite function in 1996; 84% on out-patients, 16% on in-patients. 5 departments could prove a reduction in the waiting-list. 5 departments had established the satellite function within their normal budget. 3 departments reported on difficulties in cooperating with two hospital boards. Because of the satellite function 1–3 extra jobs were established at 3 departments. All operations were performed by consulting doctors, in 5 departments also by specialized orthopedics, and in 2 departments furthermore by senior registrars. In 2 departments the satellite function was used also in training younger surgeons.

Conclusion: 12 out of 43 orthopedic departments had established a satellite function. Organizing a satellite function can be done in different ways, four models were described.

Surgery at the satellite function was mainly performed on out-patients, but larger types of surgery are introduced. Only few departments had difficulties in cooperating with the hospital boards. Establishing a satellite function in a time with reduced budgets and loaded waiting-lists could be a way to utilize ressources better and avoid closure of smaller hospitals.

Misuse of ambulance emergencies in minor injuries

D Krum-Møller[1], T Bæk Hansen[1,2] and R Thyregaard[3]

[1]Department of Orthopedics and Traumatology, Holstebro Central Hospital, Denmark, [2]The Medical Research Unit for The County of Ringkøbing, Denmark, and [3]Department of Orthopedics and Traumatology, Herning Central Hospital Denmark

In a pilot investigation performed at Holstebro Central Hospital we found several cases of misuse of ambulance emergencies for transportation of minor injuries to the A&E department. As a result we wanted to investigate the incidence of misuse and try to isolate subgroups of patients, that would have a high incidence of misuse of ambulance emergencies, for minor injuries.

Material and methods: Design: Prospective, descriptive investigation. Case records concerning all patients (2708)

treated in the period 19.0213.06.96 (115 days) at the A&E departments at Holstebro and Herning Central Hospitals (population 200,000) after sustaining an minor injury treated on an outpatient basis.

All case records were examined by one observer and classified according to mechanism of injury, injury type and type of transportation/admission to the A&E department. Evaluation of case severity by one observer could the injury possibly have been treated at a general practitioner instead?

Results: 370 patients came by ambulance (3.2/day), 252 patients came by own transportation without contact to general practitioners (2.2/day) and 2082 patients had previous contact to general practitioners (18.1/day).

The following factors were predictive of use of ambulance for transportation to the A&E department: traffic accident, high age and injuries to head and back.

Approximately 50% of all patients transported by ambulance emergency were estimated to have been able to be treated at general practitioners instead.

Conclusion: A certain amount of misuse of ambulance emergencies among patients treated for minor injuries was identified, and certain subgroups of patients were identified too. The largest subgroup was traffic accidents, where the ambulance often is alarmed by other people than the patient itself, and therefore is hardly preventable. The incidence of misuse is not more than 1.5/day in a population of appr. 200,000, and based on this study we do not recommend a health policy campaign against misuse of ambulance emergencies in minor injuries.

The effectiveness of bicycle helmets in the age group 0–15 year

L Binderup Larsen.

Accident Analysis Group, Department for Orthopedic Surgery, Odense University Hospital

In order to examine the effect of bicycle helmets in preventing head injuries a study of injured bicyclists treated at the emergency room at the Odense University Hospital was carried out.

Material and methods: Prospectively all bicyclists treated following road traffic accidents in 1993 to 1995 were examined according to injuries and use of helmet.

Only children aged 0–15 years had used helmets to an extent which made it possible to show any statistically significant effect. In the older age groups only 2–3% had worn a helmet at the time of accident.

The study included 212 patients aged 0–15 years who sustained head injuries. Forty-nine of these had head injury with AIS ≥ 2. The reference group included 949 injured bicyclists who sustained lesions localized in other body regions.

Results: The reference group had a mean use of helmet of 23%. For the age group 11–15 years this was significantly lower. By comparing these rates with the rates in the "head injury group" it was found that the odds ratio for head injury was 0.56 (90%CI 0.38–0.82) for helmet wearers compared with non wearers.

The odds ratio for head injury with AIS ≥ 2 was 0.39 (90% CI 0.16–0.94).

No risk reducing effect was found for injuries localized in the face. The effect was independent of age and sex.

Conclusion: For children aged 0-15 years bicycle helmets offer a good protection against head injuries regardless of age and sex.

The pattern of riding injuries

S Houshian and K Gade Freund

Orthopedic Department in Esbjerg, Denmark

The aim of this study was to investigate the number and types of accidents which occur in connection with horse-riding, and also to see whether horse-riding had been following special patterns revealing possibilities for prevention.

Material and methods: During the period from 1.1.1986 to 31.12.1996, 1250 patients with injuries resulting from riding or other forms of direct contact with horses were examined and treated in the Casualty Department, Esbjerg Hospital. The material was found by our EHLASS (European Home and Leasure Accident Surveillance System). This is a data base, with information based on case record. All cases reported in the above mentioned period were reviewed.

Results: The number of horse-riding accidents has increased by 150% from 1986 to 1996, but the membership of the Danish riding society (DRF) in Ribe County had increased by 30% in the same period. Females were overrepresented, the female to male sex ratio was 7:1. The age group 10–19 years accounted for 61% of the accidents.

The majority of injuries occurred when falling from the horse and involved particularly the upper part of the body. Out of 1250 injuries, 24% sustained a fracture: 64% were upper extremities, and 19% lower extremities. 100 patients were admitted: 29 for observation due to concussion; 51 for reduction of fractures and osteosynthesis; 20 for contusion.

45% of all accidents happened in a riding arena and 25% in a stable.

Conclusion: It is concluded, that the proportion of horse-riding accidents is strongly increasing. A number of measures, including better information and safety equipment, could contribute a reduction of the number and severity of the accidents.