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Fixation of olecranon osteotomy with absorbable poly-L-lactide screw—an experimental and biomechanical study on sheep

M. J. Manninen¹, U. Päivärinta¹, R. Taurio², P. Törmälä², R. Suuronen³, J. Riihä³, P. Rokkanen¹, and H. Päätiälä¹

¹Department of Orthopedics and Traumatology, University Central Hospital, SF-00260, Helsinki, ²Biomaterials Laboratory, University of Technology, Tampere and ³Department of Surgery, College of Veterinary Medicine, Helsinki, Finland

Absorbable polyester devices for fracture fixation have been commercially available for more than five years. Polyglycolide (PGA) and poly-L-lactide (PLLA) are the most suitable raw materials for absorbable rods, screws and plates. The strongest structure of these devices has been reached by self-reinforcing (SR) technique, where the implant is made of reinforcing fibers and matrix of the same material. These devices are used only in places of slight mechanical stress, alternatively a cast is used postoperatively supporting the fixation. This study was performed to test our new SR-PLLA screw in a place of hard mechanical stress.

Twenty adult and healthy Finnish sheep, weighing 57 (45–81) kg, were operated on. The left olecranon was osteotomized in ketamine-medetomidine anesthesia. The right, non-operated olecranon acted as a control. Ten osteotomies were fixed with metallic AO-cortical screws and ten with SR-PLLA screws. Radiographs were taken at three weeks and after killing. Five sheep from both groups were killed at six weeks and the rest at twelve weeks. The antibrachial bones were dissected, metallic screws were removed and the olecrani were tested with a mechanical testing machine (JJ 5003, JJ Lloyd Instruments, England) for shear strength of the healed osteotomy. The right control bones were tested in the same way. The shear strength results of the operated bone were compared with these of non-operated, thus getting comparative shear strength. For statistical evaluation, variance analysis and Student's *t*-test were used.

At one week from the operation all metal-group sheep walked well. Two from the SR-PLLA-group limped. In the 3-week radiographs it was noted that the proximal fragment of one metallic screw-fixed olecranon had partly broken, there was deformation but no total breaking of the fixation. In another metal-group sheep the proximal fragment was rotated, but the fixation was undivided. In two SR-PLLA sheep mentioned above the fixations had totally broken because of breaking of the screws. Otherwise the radio-

graphic results were good. These two failed SR-PLLA-group sheep were killed at five weeks.

At killing no new deformations were found radiographically. No significant differences between the groups were found in the radiographic evaluation. At six weeks the osteotomized bones had reached 83% strength in metal-group and 74% strength in SR-PLLA-group. After twelve weeks these proportions were 47% and 113% (two failed SR-PLLA sheep excluded), the difference being almost significant ($p < 0.05$).

In conclusion, the present study showed that this version of SR-PLLA screw cannot be used like a steel screw without external support in a place of hard mechanical stress. The rigid metallic screw fixation caused clear weakening of the fixed bone, but after the SR-PLLA screw fixation the bone increased its strength between six and twelve weeks.

Survival of cemented and noncemented knee arthroplasties

M. U. K. Lehto, T. Orava and T. S. Lindholm

Department of Surgery, Division of Orthopedics, Tampere University Hospital, Tampere, Finland

The survivorship method was adapted to analyze the failure rate and overall success of 285 knee arthroplasties performed at the Tampere University Hospital during a 12-year period.

There were 141 cemented and 144 noncemented knee arthroplasties, 177 of them performed for arthrosis and 108 for rheumatoid and related arthritides. In 22 cases a revision arthroplasty was carried out, in 14 cases in the cemented group (CG) and in 8 cases in the noncemented group (NCG). Infection was the primary reason in 5 cases (4 CG, 1 NCG), instability in 4 (3 CG, 1 NCG), loosening of the tibial component in 9 (5 CG, 4 NCG) and loosening of the femoral component in one case (CG). There was also one case of prosthetic subluxation (CG), one of patella fracture (CG) and one of arterial occlusion, which led to amputation (CG). The cumulative survival rate for cemented arthroplasties varied from 84.7 to 100% and from 91.2 to 100% for noncemented arthroplasties.

The main reason for failure was loosening of the components and the second most common was infection, the latter being, however, far more common in the cemented knee arthroplasties.

The effect of one-leg exercise on strength, power and endurance of the contralateral leg—a randomized, controlled study using isometric and concentric isokinetic training

Pekka Kannus, Kazunori Yasuda, Bruce Beynnon, Michael Kaplan, Robert Johnson, Per Renström, Denise Alosa and Lauren Cook

Department of Orthopedics and Rehabilitation, University of Vermont, Burlington, Vermont, USA

Patients and methods: 20 healthy young adults' (10 male and 10 female) knee extensor and flexor muscle performance was first tested by Cybex II+ and 340 dynamometers. Then ten subjects were randomized to train with one leg three times a week for seven weeks and the other ten served as controls. On the 8th week, the tests were repeated.

Results: Both quadriceps and hamstring muscles of the trained subjects showed a cross transfer effect from the trained limb to the untrained side. The average quadriceps peak torque change was +19% ($p < 0.001$) in the trained limb, +11% ($p < 0.01$) in the untrained limb, and 0% in the control limbs. In hamstrings, these numbers were +14% ($p < 0.01$), +5% and -1%, respectively. Concerning muscle endurance the corresponding numbers were +15% ($p < 0.01$), +7% ($p < 0.01$) and -1% in quadriceps, and +17% ($p < 0.05$), +7% and -3% in hamstrings. A positive relationship was observed between the changes in the limbs (greater improvement in the trained limb resulted in greater improvement in the untrained limb) (hamstrings: $r=0.83$, $p < 0.001$, quadriceps: $r=0.53$, $p < 0.001$).

Conclusion: In order to retard the deleterious effects of immobilization on muscle function and speed up the period of recovery during remobilization, healthy-leg exercises may be useful in patients whose injured extremity is immobilized for a longer period.

The effect of immobilization on myotendinous junction—an ultrastructural, histochemical and immunohistochemical study of the rat calf muscles

Pekka Kannus, Laszlo Jozsa, Martti Kvist, Matti Lehto and Markku Järvinen

Tampere Research Station of Sports Medicine, UKK-Institute and Department of Clinical Sciences, University of Tampere, Tampere, Sports Medical Research Unit, University of Turku, Turku, Finland and Department of Morphology, National Institute of Traumatology, Budapest, Hungary

Materials and methods: The effect of immobilization on the myotendinous junction of the calf muscles in the rat was studied histochemically, immunohistochemically and morphometrically with a transmission electron microscope.

Results: After three weeks of immobilization, the contact area between the muscle cells and tendineal collagen fibres was reduced almost 50% both in type I (slow-twitch) and type II (fast-twitch) muscle fibres. The terminal finger-like processes of the muscle cells became shallow and cylindrical or were completely atrophied. Their basal membranes were slightly thickened. Histochemically, the most remarkable alteration in the myotendinous junction was the marked decrease in the sulphate containing glycosaminoglycans. In the basal lamina of the muscle fibres, the glycosaminoglycan and proteoglycan content was also reduced. Immunohistochemical analyses revealed that the amount of type III collagen was markedly increased on the myotendinous interface, but the amount and distribution of type I collagen was not affected by immobilization.

Conclusion: These findings strongly suggest that immobilization causes marked degenerative changes at the myotendinous junction, which, in turn, most likely decrease its tensile strength and may predispose it to rupture during activity.

Results of excision of the digital nerve in Morton's metatarsalgia

Pekka Jalovaara, Katri Pakonen and Timo Niinimäki

Department of Surgery, University of Oulu, Finland

Introduction: Although the majority of cases with Morton's neuralgia can be treated by conservative means, some require surgery. The results of 48 patients treated by resection of the digital nerve are reported.

Materials and methods: The mean age of the 38 females and 10 males was 51 (21–74) years and the mean follow-up 6 (2–12) years. One intermetatarsal space was involved in 36 patients and 12 had bilateral and/or multiple disease, in total 65 interspaces were explored. The most frequent locations of the syndrome were the second and third intermetatarsal spaces. The operation was performed through a longitudinal dorsal incision. The transverse metatarsal ligament was severed and the underlying digital nerve identified and resected.

Results: A marked visible neuroma around the digital nerve was seen in 46 cases while the peroperative finding was less clear or the nerve seemed to be almost normal in 19 cases. The subjective result was excellent (no pain) in 17, good (transient slight pain) in 23, fair (occasional moderate pain, and the situation better than before operation) in 14 and poor (the complaints similar to before the operation) in 11 cases. Immediate relief of pain was observed in half of the cases, whereas in the remaining cases the effect of the measure showed gradually in a year. The associated deformities of the 56 involved feet and of the corresponding feet of the age and sex matched controls were also registered. A hallux valgus deformity was seen or had been treated surgically in 34 feet and in 12 control feet.

Conclusion: It is concluded that resection of the digital nerve gives a satisfactory result in the majority of cases with metatarsalgia localized in intermetatarsal spaces. The hallux valgus deformity seems very often to be associated with the Morton's metatarsalgia.

"A discharged patient"—a new patient grouping, is it reliable?

Timo Niinimäki and Pekka Jalovaara

Department of Surgery, University Central Hospital of Oulu, Finland

Introduction: The increase of the costs of hospital treatment is a major problem in the Western world. Different methods to describe these costs have been developed. It is possible to calculate the costs of an individual patient or to use the patient grouping system, e.g. DRG. The reliability of patient databases used in grouping is of critical importance. We have clarified the sources and magnitude of errors in basic data used in the coming Finnish grouping system.

Materials and methods: A statistics of Finnish hospitals consisting of 900,000 discharges was surveyed. The check was made for missing or illogical data on those files, which presented all possible combinations of diagnoses and operations. There were 2,835 combinations of data concerning orthopedic patients. The cases having valid data adapted easily into the grouping. The errors were evaluated from the remaining cases.

Results: Of the 2,835 diagnosis-procedure code, 2,308 proved to be liable to grouping. Either diagnosis or procedure code was lacking in 73 cases and the combination was illogical in 454 cases. Thus the reliability of possible combinations of the files was 77%.

Discussion: In a previous study (Aro, Koskinen and Keskimäki: Duodecim 106:1443-1450, 1990), 95% of diagnosis codes and 84% of procedure codes were valid. The present results are in agreement of those above. The validity of data can be improved by more exact instructions of the sequence of codes and by adopting checking procedures of the registering program.

Conclusions: The quality of data used in the patient grouping system must be improved. In addition to the improvement in registering and data processing, more advanced code retrieval systems are needed.

Adductor-plasty in patellar dislocation

Tuula Seppänen-Lehmonen and Veikko Avikainen

Middle Finland Central Hospital, Jyväskylä, Finland

The long-term results of reconstruction of patellofemoral ligament in acute or recurrent patellar dislocation were com-

pared to those of medial capsular reefing with or without lateral retinacular release or to patellar realignment by antero-medialisation of the tuberositas tibiae.

The mean follow-up time was eight years. 14 knees were treated by patellofemoral ligament reconstruction, 17 by medial reefing, 22 by medial reefing plus lateral release and eight by patellar realignment. The material was not comparable in respect to patellar realignment because this was made only in recurrent dislocation with painful chondromalacia and increased Q-angle.

The patellofemoral ligament was since 1982 reconstructed by a new method (VA): suturing or reinsertion of the disrupted patellofemoral ligament to the medial femoral condyle and turning a distally based strip of adductor magnus tendon to fortify the ligament. Redislocation occurred in 30% with medial reefing, 41% with medial reefing plus lateral release, 50% with patellar realignment but only 7% with patellofemoral ligament reconstruction.

The subjective results were best with patellofemoral ligament reconstruction (12/14 good). The subjective results did not correlate with occasional redislocations.

Clinical and radiographic result of cementless total hip arthroplasty

Ilkka Lautiainen, Jaako Joukainen and E. Antero Mäkelä

Department of Orthopedics and Traumatology, Kuopio University Hospital, Kuopio, Finland

Introduction: The use of cemented total hip prostheses has revealed that aseptic loosening of the components is the most significant long-term problem. The growing rate of revision surgery has stimulated research in the area of fixation. The purpose of this study is to present the results of 72 patients followed for a minimum of 3.5 years after a primary arthroplasty with uncemented components.

Patients and methods: From August 1983 to March 1987, 72 patients were treated with 76 cementless total hip arthroplasties (THA) at the Kuopio University Hospital. The mean age of the patients was 57 years. There were 24 men and 48 women. Preoperative diagnosis were arthrosis (70%), rheumatoid arthritis (25%) and miscellaneous (5%). Three types of prostheses were used: the Lord in 49 cases, the Link in 20 cases and Butel in seven cases. After a mean follow-up period of 4.8 years, the patients had a clinical and radiographic assessment and a modified Mayo hip rating score was then tabulated for each hip.

Results: The mean score was 90.2 points. Over 95% of the patients were assessed as fair or good. Thigh pain was a common complaint. There were two wound infections, two dislocations, one fracture in the calcar region and one deep venous thrombosis in the immediate postoperative period. In the follow-up time overall revision rate was 7%.

Conclusions: The rate of revision is somewhat higher than in other series with comparable follow-up time. The present series represents the first experiences of our clinic of

cementless hip prostheses. Changes in design and coating of implants as well as improvements in surgical technique that have evolved over the past decade are expected to provide better long-term fixation.

Increased periarticular bone resorption in rheumatoid arthritis

Heikki Kröger, Ilkka Arnala, Veikko Rehnberg, Martti Hämäläinen and Esko Alhava

Department of Surgery, Kuopio University Hospital, Kuopio, and Rheumatism Foundation Hospital, Heinola, Finland

Periarticular bone loss is a common feature of rheumatoid arthritis (RA). However, the cellular basis and etiology of this phenomenon have not been established. Periarticular bone samples obtained from metatarsal resections and total knee arthroplasties were studied histomorphometrically. Bone histomorphometry revealed decreased trabecular bone volume and increased bone resorption in RA patients (N=26). The increased bone turnover was most marked in the vicinity of inflammatory cells. We conclude that periarticular bone loss in RA is due to increased bone resorption.

Lumbar spinal stenosis—the impact of the length of the laminectomy on physical fitness

Arto Herno, Olavi Airaksinen and Jukka Siljander

Departments of Orthopedics and Physical Medicine and Rehabilitation, Kuopio University Hospital, 70210 Kuopio, Finland

Introduction: The operative dilemma in spinal stenosis surgery is to ensure that the critical segment of stenosis is effectively decompressed. The aim of the study was to evaluate the impact of the length of the laminectomy on physical fitness.

Material: During the period 1985 through 1987, 243 patients were operated for lumbar spinal stenosis. 95 patients (51 men and 44 women) with a mean age of 56 years were included in this study. The operative treatment consisted of hemi- or total laminectomies at mean 1.6±0.9 levels. The intervention was made four years after surgery.

Methods: The walking capacity of the patients was recorded by treadmill (Tunturi®, Turku, Finland) with a speed of 3600 meters per hour. The muscle strength of trunk flexion and extension were determined by isometric measurements in standing position with an isometric strain-gauge dynamometer (Digitest® Ltd, Muurame, Finland). The daily activities were measured by Oswestry questionnaire.

Results: The length of laminectomy correlated with the

walking capacity ($P < 0.02$). The Oswestry index showed a tendency to correlation ($P = 0.051$) with the length of laminectomy. The muscle strength of flexion and extension did not correlate with the length of operative decompression.

Conclusion: The length of laminectomy has an impact on the patient's walking capacity and also some influence on daily activities. However, the trunk muscle strength did not correlate to the length of operative decompression.

Solid fusion versus nonunion in long-term follow-up of operatively treated isthmic spondylolisthesis in young patients

Seppo Seitsalo, Dietrich Schlenzka, Juhani Soini, Mikko Poussa, Kalevi Österman and Kaj Tallroth

Orthopedic Hospital of the Invalid Foundation, Helsinki

A clinical and radiographic follow-up of 175 patients operated on below the age of 20 between 1952 and 1980 for symptomatic isthmic spondylolisthesis is presented. The mean observation time was 15 years. There were 89 girls and 86 boys. The fusion technique was posterior in 112 cases, posterolateral in 60 cases and anterior in three cases. Fusion alone was performed in 111 patients, 34 had concomitant laminectomy. One segment (L5-S1) was fused in 54 patients, two segments (L4-S1) in 104 and three segments (L3-S1) in 17. Autogenous cortico-spongy bone was used in 119 cases, free periosteal grafts in 56. At follow-up solid bony fusion was found in 145 patients, 30 patients (17%) had a pseudarthrosis. The data of those two groups (solid fusion/nonunion) were compared statistically.

Gender had no influence on the clinical or radiographic outcome of the fusion. Pseudarthrosis occurred significantly more often in Grade I slips (24/66), than in Grade II (3/41), III (3/38) or IV (0/30). Spina bifida or preoperative progression of the slip had no influence on the bony healing. Postoperative progression was seen significantly more often ($P < 0.05$) in patients with solid fusion. Pseudarthrosis frequency was significantly higher after posterior fusion compared with posterolateral fusion ($P < 0.05$), in two-level fusions compared with one-level fusion ($P = 0.003$), and after use of periosteal grafts compared with cortico-spongy bone ($P < 0.01$). Posterior fusion technique using periosteal grafts showed the highest rate of non-unions, posterolateral technique with corticospongy bone the highest rate of successful fusions ($P \leq 0.001$).

Nonunion had no significant influence on the clinical result in long-term. Postoperative pain, however, lasted longer in non-union patients (mean 14.2 months) than in successfully fused patients (mean 4.5 months) ($p < 0.01$). The results show the benignity of the condition which seems to be a self-limiting process leading to stabilization of the affected segment. Posterolateral fusion technique using autogenous cortico-spongy bone grafts is recommended as the method of choice for most cases.