Finnish Orthopedic Association

Mariehamn, May 11–12, 1990

Editor: Seppo Seitsalo
Liinasaarenkuja 3–5 D7
SF-02160, Esbo, Finland

Progression of spondylolisthesis in children and adolescents: A long-term follow-up of 272 patients

Seppo Seitsalo, Kalevi Österman, Hannu Hyvärinen, Kaj Tallroth and Dietrich Schlenzka

The Orthopedic Hospital of the Invalid Foundation, and Helsinki Jorvi Hospital, Helsinki, Finland

The progression of the spondylolisthesis is rare after cessation of the growth. The risk of progression has widely been accepted as an indication of operative fusion in children and adolescents. We still do not know why some slippings do not progress and other slippings displace even until a total spondyloptosis presents.

Aims: The aims of the study were 1) to analyze how much and how frequently progression of the spondylolisthesis occurs after the first radiographic examination in children and adolescents, 2) to determine possible clinical or radiographic prognostic factors for the further progression, and 3) to analyze what effect the fusion in situ has on the progression.

Patients: Radiographic progression of slipping in spondylolisthesis in children and adolescents treated under the age of 20 years either operatively or conservatively was studied. Posterior or posterolateral fusion in situ was performed in 190 patients, and 82 patients were treated conservatively. There were 134 girls and 138 boys. The mean age at admission was 14 years, and the follow-up mean time was 15 (5–32) years. The fifth lumbar segment was affected in 265 and the fourth segment in 7 patients. The degree of the slipping was measured as a percentage of the width of the olisthetic vertebral body. The average slipping in the first radiograph was 38 (5–138) percent.

Results: Progression of the slipping during the follow-up was on an average 3.5 percent (from –30 to 98 percent). Ninety percent of the final slipping on an average had already occurred at the time of first radiographic examination. Progression of more than 10 percent was seen in 62 patients. Spontaneous correction of the slipping more than 10 percent was seen in 17 patients. The modality of treatment (conservative or operative) had statistically no effect on progression. Although dysplasia (spina bifida) at the lumbosacral junction and female gender were associated with more severe slippings, they statistically had no prognostic value for the further progression. In the regression analysis, lumbar lordosis, rounding of the sacral endplate, or lumbar index (wedge form of the olisthetic vertebra) represented no prognostic value. They were secondary to the slipping: they express it, but they do not predict it.

The only radiographic variable having predictive value on the risk of further progression was the degree of primary slipping. The risk of further slipping was significant if the initial slipping was 20 percent or more. In age groups that corresponded to the phase of prepubertal growth spurt (girls 9–12 years, boys 11–14 years), there was a tendency to undergo progression, which was more significant than in other age groups.

Intervertebral disc changes in adolescents with symptomatic L5 spondylolisthesis

Dietrich Schlenzka, Seppo Seitsalo, Mikko Poussa and Kalevi Österman

The Orthopedic Hospital of the Invalid Foundation, and Helsinki Jorvi Hospital, Helsinki, Finland

Changes in the intervertebral discs have been mentioned as one source of pain in isthmic spondylolisthesis. Frequency of such changes in adolescent patients is unknown. In the present study the lower lumbar discs in symptomatic adolescent spondylolisthesis patients were evaluated using radiography, discography, and MRI to establish a possible relationship between the radiographic features of the slipping and disc changes.

Patients: There were 27 patients—14 girls and 13 boys. The mean age at admission was 14 (11–18) years. The duration of symptoms was 25 ± 22 months. In addition to the plain radiography in all the patients, discography of three lower levels were performed in 23 and MRI in 16 patients. In 12 patients, both examinations were done.

Results: The slipping in girls was on an average 45 ± 23 percent and in boys 27 ± 17 percent ($P < 0.05$). In plain radiographs a normal presacral disc was seen in 11 patients with 14.5 percent slipping, narrowing of the disc height < 50 percent in 4 patients with 24 percent slipping and > 50 percent in 12 patients with 52.6 percent slipping ($P < 0.01$). The L4–5 disc was intact in all the patients. In discography and MRI the presacral disc was degenerated in all the patients. In discography the L4–5 disc was normal in 3, ruptured in 7, and degenerated in 12 patients. Degeneration seems to be associated with retroposition of the L4 vertebra. MRI findings correlated with the discography fairly well on that level.

Discussion: The results of this series show that early disc degeneration in spondylolisthesis seems to be more common than expected also on the L4–5 level. Evaluation of the role of the initial disc lesion in the development of spondylolysis and progression of the slipping needs further research.

The "Fixateur interne" in burst fractures of the thoracolumbar spine: Preoperative and postoperative encroachment of the spinal canal

Pertti Myllynen, Erkki Laasonen, Markku Vornanen, Anne Alberty, Uolevi Lahdenranta, Ole Böstman and Pentti Rokkanen

Department of Orthopedics and Traumatology, Helsinki University Central Hospital, Helsinki, Finland

Summary: The objectives of our study were to clarify the ability of "Fixateur interne" to reduce a detached posterior bony fragment of the vertebral body and to compare the information obtained by plain and CT radiographs in those cases. Out of the first 29 patients, we selected those 22 whose fractures were classified as being of burst type. The preoperative and postoperative native and CT radiographs were examined. The widening of the sagittal width of the vertebral body was measured separately both from the lateral plain and from the axial CT. These figures were then transformed into an encroachment of the spinal canal by comparing the fracture area to the neighboring healthy segments. No encroachment was expressed by 0 percent and a total occlusion by 100 percent. The mean preoperative and postoperative encroachments ± SD were 51 ± 22 and 30 ± 23 percent, respectively. The postoperative encroachment of the spinal canal was well correlated with the preoperative condition ($P < 0.01$, $r = 0.611$, $n = 22$). In general, the correlation of measurements from native and CT radiographs was good. However, when the fragment did not locate in midline or was oblique and duplicate, native radiographs showed more encroachment than CT. The present study shows that also after the transpedicular fixation and distraction with the "fixateur interne" the dislocated posterosuperior body most often remains dislocated. CT increases the diagnostic accuracy in burst fractures, although in most cases good plain films provide sufficient information about the condition of the spinal canal.

Myelography, CT, and ENMG in lumbosacral disc disease

Seppo Santavirta, Kaj Tallroth, Antti Eskola and Visa Honkanen

The Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland

Fifty-five patients who underwent lower spine surgery for disc disease were preoperatively evaluated with myelography and postmyelography CT. ENMG was done on 23 patients. CT had the highest accuracy in finding the affected level ($F = 75.5$: $P < 0.0005$) as compared with myelography ($F = 46.5$; $P < 0.0005$) or to ENMG ($F = 11.4$; $P < 0.15$). We did not find statistical differences in diagnostic accuracy in different disc spaces, nor was there a difference between primary and recurrent low-back disease.

Primary total hip arthroplasties with a cementless Lord endoprosthesis in Tampere University Central Hospital between 1984 and 1988: Analysis of complications

Pentti Lepistö and Heikki Laine

Department of Orthopedics, Tampere University Central Hospital, and Department of Clinical Sciences, University of Tampere, Tampere, Finland

Between 1984 and 1988, 241 primary total hip arthroplasties using the Lord cementless endoprosthesis were performed at the Tampere University Central Hospital. Of these, 231 hips in 212 patients were available for the study, with an average follow-up period of 25 (10–57) months. In the majority of the cases, indications for an operation was arthrosis (179 hips, 77.5 percent).

Complications included 1 postoperative death (0.4 percent), 3 early infections (1.3 percent), 3 late infections (1.3 percent), 3 aseptic loosenings (1.3 percent), and 15 dislocations (6.5 percent).

Revision of one or both anchored components was needed in 7 cases, and in 3 cases the replaceable femoral head component was changed, so the total revision rate was 4.3 percent.

According to our clinical evaluation system, 67.0 percent of the hips were graded as excellent or good, 21.6 percent were graded as fair, and 10.4 percent as poor.

The results were significantly poorer in the patients that had been operated on because of a fracture or nonunion of the femoral neck.

The infection rate was slightly increased as compared with previous cementless THA reports. All the early infections were linked with early dislocation, and two of them were in the femoral-neck fracture group.

Outcome of operative treatment for supraspinatus tendinitis

Timo Kyyrönen, Matti Lehto, Timo Paakkala, Markku Järvinen, Pentti Lepistö, Eino Rintamäki and Timo Telaranta

Tampere University Central Hospital, Department of Orthopedics and Radiology, Tampere, Finland

Sixty-seven patients (70 shoulders) were treated operatively for supraspinatus tendinitis at Tampere University Central Hospital from 1980 to 1987. Three patients had been previously operated on for rupture of the supraspinatus tendon in the contralateral shoulder. Twelve shoulders had to be excluded from the study because of insufficient available information. Thirty-one of the patients were women and 36 men, with an average age of 47 and 45, respectively. Follow-up evaluations ranged form 1.5 to 9.5 years.

According to Wolfgang's rating system, the results were excellent in 33, good in 14, fair in 8, and poor in 3 of the cases. All the patients under aged 35 years had excellent results ($P < 0.01$). Also the patients who were operated on during the 6 months from the onset of symptoms had excellent results. The 3 poor cases were men who had had manual labor occupations. Sex, operative method, and resection of the coracoacromial ligament did not affect the result. Patients without arthrosis of the acromioclavicular joint had better results, and concave shape of the acromion tended to worsen the result, although these findings were not statistically significant.

Results in fractures of the radial head treated by excision

Pekka Jalovaara and Timo Niinimäki

University Central Hospital of Oulu, Oulu, Finland

Resection of the radial head for a displaced, depressed, and comminuted fracture of the radial head is widely practiced. Some authors have reported it to give poor results because of radial shortening leading to distal radioulnar subluxation and troublesome wrist symptoms. This study was undertaken to evaluate the long-term effects after excision of the radial head.

Material: Included in this study were 23 patients with Mason (1) types II and III fractures who had undergone resection of the head of the radius. The median age of the patients was 42 years, and the median follow-up was 5 years.

Results: Limitation of flexion was observed in 4 patients, extension in 16, pronation in 7, and supination in 11 patients. Disabling loss of strength of the upper limb was found in 12 patients. Eight cases displayed no proximal migration of the radius. The average migration including the former cases was 1.4 mm. Nine patients had no arthrosis of the wrist. It was slight in 13 cases and moderate in 1 case. No signs of arthrosis of the elbow was observed in 5 cases. It was slight in 10 patients, moderate in 6, and severe in 1. Fourteen patients had at least mild occasional pain in the wrist and 19 in the elbow. The overall result was excellent in 1, good in 10, fair in 9, and poor in 3 patients.

Conclusions: Excision of the radial head because of a fracture is frequently followed by pain in the wrist and elbow, limitation of motion, loss of strength, and some degree of arthrosis of the wrist and elbow. However, these changes and symptoms are usually mild in nature so that a relatively good functional result can be expected in most cases. Nevertheless, because the results of conservative treatment are almost as good as those of excisional surgery, the indications for excision of the radial head should be limited.

Hemarthrosis of the clinically stable knee due to sports and military training

Tuomo Visuri[1], Markku Koskenvuo[2] and Seppo Dahlström[1]

Central Military Hospital Tilkka[1], Helsinki, and Department of Public Health[2], University of Helsinki, Helsinki, Finland

Findings of an early arthroscopy performed for 108 consecutive hemarthrotic and clinically stable knees were analyzed. All the patients were young Finnish conscripts with a mean age of 20 years. Fifty-seven of the knees were injured during military training, 36 in sports activities, 9 in a fall, and 6 in motorbike accidents. The injuries were classified as main or concomitant lesions according to their occurrence.

An average of 1.6 lesions per knee were observed. From the main injuries, dislocation of the patella was observed in 38 (35 percent) cases. It was combined with a medial capsular tear in 31, with an osteochondral fracture of the medial margin of the patella in 27, and with an osteochondral fracture of the lateral femoral condyle in 10 cases.

Dislocation of the patella was associated with military training in 29 (51 percent) cases ($P < 0.001$).

Tears of the anterior cruciate ligament (ACL) were seen in 37 (34 percent) cases. Complete tears were observed in 7, partial in 21, and distension in 9 cases. ACL tears were combined with meniscal tears in 13, with tears of the medial collateral ligament in 10, and with osteochondral fractures in 6 cases. The ACL lesions were related to sports activities in 22 (63 percent) cases ($P < 0.001$).

Seventeen isolated medial and lateral meniscal ruptures were observed, as well as eight osteochondral fractures, six tears of the medial collateral ligament, and two synovial contusions.

There are severe lesions behind the clinically stable hemarthrotic knee in young male adults. Totally, 78 (72 percent) knees of our cases needed surgical treatment: 34 arthroscopic surgery and 44 open knee surgery.

Effects of physeal distraction on the vascular supply of the physis

Anne Alberty, Jari Peltonen and Veijo Ritsilä

The Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland

The vascular supply of the physis comes from three sources: the epiphyseal, perichondral, and metaphyseal vessels. The hypertrophic zone is avascular (1). The epiphyseal vessels are related to growth in length and metaphyseal vessels to calcification and ossification of the metaphysis (2). During physeal distraction, damage to the vascular supply of the physis is possible and could explain later disturbances in growth.

Material and methods: Distraction of the distal femoral physis of the rabbit was performed. In the first group (13 rabbits), a unilateral frame with four 2-mm pins was used. In the second group (11 rabbits), a circular apparatus with four 1-mm Kirschner wires was used. The contralateral femur served either as a nonoperated on control or a sham operation was performed (fixation pins without apparatus).

The effects of distraction on the vasculature were studied by microangiography using barium sulfate (Micropaque®) after 4, 9, and 21 days of distraction, immediately, and after 6 weeks. After fixation in formalin, decalcification, and embedding in paraffin and beeswax, sections of 500 μ were studied by contact microradiography.

Results: The nonoperated on controls showed good filling of epiphyseal, metaphyseal, and perichondal vessels. In the first study, disturbances in capillary filling were seen both on the epiphyseal and the metaphyseal side, the epiphyseal side being affected more. Similar, but milder, changes occurred also in the sham operated on bones. In the second study the capillary filling was mostly regular in all the bones. The epiphyseal end arteries seemed markedly thickened and tortuous immediately after distraction. After 6 weeks, vascular anastomoses between the epiphysis and metaphysis were seen.

Conclusions: Two-millimeter fixation pins caused vascular disturbances, whereas 1-mm pins did not. Distraction seemed to cause hyperemia in the epiphyseal capillaries. After 6 weeks, vascular anastomoses occurred probably leading to bone bridges.

References

1. Bright CT. structure and function of the growth plate. *Clin Orthop* 1978; 136: 22–32.
2. Trueta J and Amato V P. The vascular contribution to osteogenesis. III Changes in the growth cartilage caused by experimentally induced ischemia. *J Bone Joint Surg* 1960; 42 (Br): 571–587.

Inebriated patients in the emergency room: Sociomedical problems in trauma care

Matti Lehto[1], Allan Aho, Hannu Penttilä, Matti Pursimo and Anita Vastamäki

Departments of Surgery, Turku University Central Hospital, Turku, and Tampere University Central Hospital[1], Tampere, Finland

The Department of Emergency Medicine at the Turku University Central Hospital (TUCH) has monitored the number of inebriated patients admitted for treatment to the emergency room (ER) over a 2-month period during 1983 (548/5,416 patients, or 10 percent). This study attempts to illustrate not only the medical and sociomedical problems these patients present in the course of their treatment, but also the difficulties their presence create for the staff and for other patients.

Two thirds of the inebriated patients were severely alcohol-intoxicated young men, 60 percent of whom were trauma cases. Emergency care was necessitated most often as a result of a head injury received during an assault or accident. Although the degree of injury was often negligible, 13 percent of the patients required admission for inpatient care. A large percentage of the accidents occurred after general working hours and on weekends. On weekends, every fifth patient was found to be under the influence of alcohol. The incidence of illicit drug-related intoxication was not measured; on the other hand, prescription drug abuse was found in 4 percent of the cases. The ER staff testified as to the marked disturbance in smooth work flow caused by the inebriated patients, which affected the treatment of other patients as well. The function of the ER should be directed towards emergency medical care, ideally leaving psychosocial problems caused by inebriation to be handled by personnel specifically trained for dealing with them.

The reliability of measurements with the variokinetic device

Urho Väätäinen[1], Olavi Airaksinen[2] and Pekka Rantanen[2]

Departments of Surgery[1], and Physical Medicine and Rehabilitation[2], Kuopio University Central Hospital, Kuopio, Finland

Aim: The muscle strength of the lower extremities can be measured in different ways; however, isometric and isokinetic techniques are mostly used. The variokinetic device is based on a variable resistance machine. The purpose of this study was to evaluate the reliability of variokinetic measurements.

Method: The study group comprised 8 healthy volunteers (6 males and 2 females). David Rehab-systems 2200 and a MC-1 measurement unit (David International Ltd, Helsinki, Finland) were used. Two physiotherapists made the measurement of knee extension separately at two different times during 1 week.

Results: The peak torque of first measurement was 226 ± 38) Nm and the second 228 (± 35) Nm. The Pearson's correlation coefficient was $r = 0.96$ ($P < 0.01$). The mean values of rms-EMG varied from 510 (± 202) mV to 570 (± 164) mV on the muscles vastus medialis and vastus lateralis. The correlation coefficients of two separate measurements on the same muscles were $r = 0.81$ ($P < 0.05$). The correlation coefficient on the rectus femoris muscle was $r = 0.94$ ($P < 0.005$).

Conclusions: Our results suggested that the variometric measurement of knee extension was reliable.

Bone banking in University Central Hospital of Turku

Allan J. Aho, Hannu T. Aro, Tuomas Yli-Jama and Sakari Einola

Department of Surgery, University Central Hospital of Turku, Turku, Finland

Bone banking was begun in 1972 at our surgery department for bone tumor surgery. It was based on our experiences gained in experimental joint transplantation surgery in dogs. The bone and grafts included joint cartilage and the metaphyseal part of a long bone, and were harvested from young healthy individuals after a sudden accidental death, in general due to brain injury. During the past decade, a kidney donor has also been a typical donor to bank bone. Infections (blood cultures) and viral diseases are screened for. Serologic testing for Rh-factor, hepatitis B, cytomegalovirus; and HIV is performed. Retrieval of cadaver bone has been performed in an operation theater in a sterile environment; the procedure includes swab and bone-piece cultures for bacterial control. From 1975, femoral heads have been harvested from living donors with a femoral neck fracture. The soft tissues have been dissected and the graft is stored at –80 °C according to a modified Imamaliev method. A total of 173 retrieval procedures have been done, and bank bone has been used in over 100 operations. Bank bone has most often been used for bone defects in total hip revision surgery as a substitution material and especially as massive bone allografts with joint surface for bone tumor reconstructive surgery.

Key to Data Management: Coding of surgical procedures

Timo Niinimäki and Pekka Jalovaara

Department of Surgery, Oulu University Central Hospital, Oulu, Finland

About one third of all surgical procedures are of an orthopedic or traumatologic kind. Data on these have been compiled in a country-wide discharge register since 1986, an essential accessory to which is a coding system for surgical procedures. A number of such systems are in existence, and each of the Nordic countries, for example, has its own. The systematic structuring of such classifications is discussed here, with particular emphasis on the question of what kind of system would be appropriate from an orthopedic point of view.

Methodology: The method adopted is to reassess the current procedural terminology in accordance with comparative classifications and to design a comprehensive coding on the basis of this.

Results: Considerable differences have been observed to exist between nomenclatures and classifications, and a part of the field of spinal surgery, for example, remains undefined. This can be corrected in the course of the reassessment process provided that the statistical system contains diagnoses that describe anatomic areas.

Discussion: The axes used in the coding system are anatomic location, extent of the procedure, incision, method, technical equipment, and need of revision. It is impossible to construct any logical hierarchical order for these, but the method used here leaves space for a compromise between them. One problem is that however universally applicable the coding is, it will not remain permanent. The rapid advances being made in medicine will make it essential to revise the codes continuously.

References

1. *Physician's Current Procedural Terminology*, Fourth Ed. CPT 1990, American Medical Association, Chicago, 1989.
2. *Nordic Short List of Surgical Operations*, Nomesco, Copenhagen, 1989.