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Reactive oxygen species and synovial fluid hyaluronate

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The viscosity of the synovial fluid (SF) and polymerization of hyaluronate (HA) are decreased in rheumatoid arthritis. The reason for this is not exactly known, but oxygen-derived free radicals (ODFR) have been suggested to be responsible for the depolymerization of SF HA, resulting in decreased SF viscosity.

In this work, we have studied the effects of ODFR produced by xanthine oxidase (XAO) or activated neutrophilic leukocytes in the SF HA. High-performance liquid chromatography (HPLC) equipped with a size-exclusion column was used to determine simultaneously the degree of polymerization and concentration of SF HA. Alternatively, the effect of myeloperoxidase/hypochlorous acid (MPO/HClO) in SF HA was also studied.

The HA synthesis of synovial fibroblast monolayer cultures was stimulated when interleukin-1 (Il-1) was present in the culture media in both rheumatoid and arthrotic synovial fibroblasts. Il-1 did not affect the molecular size of the synthesized HA.

Hydroxyl radicals produced with HX/XAO, depolymerized SF HA to small molecular size fragments (MW 13,500 daltons), whereas activated neutrophilic leukocytes decreased the molecular weight approximately from 4.0 to 1.5 x 10^6 daltons. MPO, originating from human neutrophils, had no effect on SF HA. Even if unphysiologically large amounts of HClO were added to the SF sample, no depolymerization of HA or decrease in viscosity was observed. Instead, purified HA from human umbilical cord was easily depolymerized with the MPO/HClO system. This could imply that in in vivo conditions HClO reacts with other components of SF, which in practice scavenge SF HA. In contrast, hydroxyl radicals produced by the iron-catalyzed Haber-Weiss reaction may be responsible for the depolymerization of SF HA and decrease of SF viscosity.

Mast cells and neuropeptide nerves in the adjuvant arthritic rat

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Connective tissue mast cells and peptide-immunoreactive nerves have been implicated in the pathogenesis of arthritis. In the present study, adjuvant arthritis (AA) in PVG rats was induced by injecting a suspension of *Mycobacterium butyricum* in paraffin oil into the tail base. Twenty-eight days later, the rats were anesthetized, perfusion-fixed with Bouin's solution, and tissue sections were prepared through the ankle joints. Immunostaining with protein gene product 9.5 (PGP), substance P, or calcitonin gene-related peptide (CGRP) antisera was successfully combined with metachromatic staining of mast-cell granule heparin or histochemical staining of granule-associated esterase. PGP- and peptide immunoreactive nerve/mast cell units were observed both in normal and in arthritic synovial tissue. However, in the arthritic rat, synovial villi and sublining synovial stroma were devoid of peptide-immunoreactive nerve/mast cell units, although such units were observed in the joint periphery. Our observations suggest that immunostaining can be successfully combined with mast-cell staining and can be used to study the spatial relationship of peptide-immunoreactive nerves and mast cells. It was also shown that the chronic erosive phase of AA is

characterized by peripheral "autodenervation." Alternatively, the inflammatory synovial mass may grow so rapidly that neuropeptide nerve-mast cell units are unable to keep pace with the growth rate of the proliferative synovitis tissue.

The cellular source and mechanism of action of collagenase in human rheumatoid synovial tissue

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Collagenase activity in human rheumatoid synovial tissue was found to be of fibroblast origin as judged from the relative susceptibility of types I, II, and III collagens to the enzyme. The secretion and autoactivation of collagenase could be induced by interleukin-1, and collagenase could be further activated by gold thioglucose and phenylmercuric chloride The activation of collagenases by nonproteolytic activators, such as organomercurials, has been found to be associated with decreased thermal stability of the enzyme. This could imply that the activation achieved with these compounds is associated with decreased catalytic age of collagenases and thus in part explains the beneficial effects of gold compounds in the therapy of rheumatoid arthritis.

Chromosome studies in bone tumors

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For many neoplastic disorders, cytogenetic studies have provided important diagnostic and prognostic indications for clinicians. Chromosomal aberrations, like in hematologic malignancies, can be identified in bone tumors.

Patients and methods: In this series, chromosome studies in the diagnosis of bone tumor were performed in 38 consecutive cases of benign and malignant tumors. The cell suspension of the fresh specimen was obtained mechanically and/or by collagenase enzyme digestion. Cells were cultured from 12 hours to 1 month in Falcon flaskets. Harvesting was started when the mitotic figures were observed in the culture. Colcemid treatment was used to arrest the metaphase cells. After air drying, G-banding staining was done, and the karyograms were made after microscopy and photography.

Results: A diagnostic result was achieved in 28 samples, and in 10 cases mitoses were not found for analysis. A clonal chromosomal abnormality was found in 9 cases. A characteristic and consistent change was a translocation between chromosomes 11 and 22 in Ewing's sarcoma.

Conclusion: Cytogenetic analysis combined with histopathologic and histochemical examinations will most probably improve the classification of bone tumors.

Resection of thoracic vertebra for hemangioma under deep hypothermia and circulatory arrest: A case report

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In a 12-year-old girl, a hemangioma of the 6th thoracic vertebra caused medullary compression and paraparesis. After a decompressive laminectomy, she recovered totally. Because of progressive kyphosis, both anterior and posterior spinal fusion were performed. The patient was well for 2 years, but then developed a progressive paraparesis. According to CT, both the bulging 6th vertebral body and the left pedicle caused medullary compression. Because the bleeding had been a problem in all the previous operations, it was concluded that the risk of uncontrollable bleeding or iatrogenic damage to the spinal cord during removal of the affected vertebra was probably higher than the risk of deep hypothermia and circulatory arrest in competent hands. For this reason the latter alternative was chosen.

Operative technique: The methods of cardiopulmonary bypass, hypothermia, and cardiac arrest routinely used in open heart surgery were used. After clamping the aorta, the vertebral body and the pedicles were removed and the cavity was filled with autogenous bone. The time of total circulatory arrest was 57 minutes. The total time of the operation was 8 hours.

Complications and follow-up: Postoperatively, the patient developed a reactive psychosis and wound infection, but recovered slowly and was referred to a rehabilitation center 8 weeks after the operation. Six months after the operation, the patient was mentally normal and had complete neurologic recovery. Eighteen months postoperatively, she was asymptomatic and the spinal canal had normal width (CT).

Conclusions: Deep hypothermia and circulatory arrest are a useful alternative in selected orthopedic operations with the risk of uncontrollable bleeding. The methods of extracorporal circulation and hypothermia must be mastered routinely, and the whole procedure and cooperation of the team must be meticulously planned.

Autotraction stress radiography of the glenohumeral joint in the diagnosis of general laxity of the joint and of inferior and anterior instability

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Most of the radiologic methods for the diagnosis of shoulder instability image the secondary lesions caused by dislocations. The demonstration of the dislocation itself requires anesthesia for provocation of instability between the scapula and humerus. We present a new method in which stress on the shoulder joint may demonstrate subluxation and in some cases even dislocation.

Material and methods: The anterior and inferior shift of the humeral head is brought about by the patient when he grasps his knee with both hands and stretches the shoulder joint by extending the flexed hip. In this position an anterior-posterior and an axial view are taken. With this method, we have studied 19 normal shoulder joints, 16 recurrent anterior dislocations, 11 chronic subluxations, and 9 multidirectional instabilities.

Results: The mean anterior and inferior shifts were in controls 3 and 6 mm, in recurrent dislocations 5 and 9 mm, in chronic subluxations 21 and 19 mm, and in multidirectional instabilities 27 and 26 mm.

Conclusions: The autotraction stress radiography of the glenohumeral joint described revealed considerably greater anterior and inferior shift of the humeral head from the glenoid fossa in chronic subluxations and multidirectional instabilities than in recurrent dislocations. On the other hand, the difference between chronic subluxations and multidirectional instabilities, although statistically significant, was too small to allow secure differential diagnosis between these types of instabilities. This method may be a good adjunct in the diagnosis of shoulder instability.

Limb lengthening using the method of Ilizarov

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In 1951, Ilizarov developed an apparatus for external fixation where K-wires transfixing the bone fragments were fixed in circular frames under tension. The method has been used only for a few years in Western Europe, and its usefulness in still unclear.

Patients and methods: The material consists of four femoral and seven tibial lengthenings. All the patients except 1 had a congenital deformity. The average age of the patients was 11 (7–15) years. Usually two or three frames were used complemented with additional side-fixation pieces. The number of wires was therefore usually at least eight. A corticotomy was made as close to the metaphysis as possible. The speed of distraction was 1 mm/day. The apparatus was removed when radiographs demonstrated good consolidation of the distraction area.

Results: The average lengthening was 5.4 (3.3–7) cm, in the femur 5.7 (4.5–7) cm, and in the tibia 4.8 (3.3–6) cm, which was about 16 percent of the total length of the corresponding bones. The healing index was 27.2 days/cm lengthening.

There were 11 complications: one psychotic reaction, two pin-tract infections, three fractures, two valgus deformities of the tibia, one varus deformity of the femur, and three premature fusions of the distraction area. None of these had any influence on the final result.

Discussion: The circular fixation of the Ilizarow apparatus is three dimensional and allows immediate full weight bearing. The method proved to be useful in limb lengthening. The risks of serious complications and the need of accessory operative procedures were negligible. The application of the apparatus is time-consuming, and the need of daily physiotherapy is considerable. The most negative feature of the method was the limitation of the movement of the adjacent joints and the unsatisfactory function of the muscles during the external fixation accompanied by the elevated risk of infection at the upper part of the thigh. Therefore, the authors recommend unilateral type of fixation in femoral lengthening.

Femoral neuropathy after total hip replacement

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Seven patients with a femoral nerve lesion after total hip replacement were treated at the Orthopedic Hospital of the Invalid Foundation in Helsinki. One of them had been referred from another hospital, and 6 had been operated on in our hospital

There were 1 male and 6 females. The mean age of the patients was 59 (38–71) years. The posterior approach was used in 3 Lord cases, anterolateral in 3 Lubinus cases, and

straight lateral in the Mueller case. The reason to perform arthroplasty was for 5 patients arthrosis, for 1 patient rearthroplasty, and for 1 patient conversion arthroplasty after a hip fusion. Clinically, the patients showed complete femoral nerve paralysis.

Five cases were operated on by the author 3 (1–6) months after the replacement. In 3 cases external neurolysis had been performed. In 1 case where the nerve had been cut inadvertently when performing adductor tenotomy, the nerve was reconstructed using free nerve grafts. The nerve of a 72-year-old patient had been burned by cement so severely that repair was not considered reasonable.

In the conversion arthroplasty the femoral nerve was very tightly compressed by the inguinal ligament. The nerve was also compressed more proximally by free bone grafts used to strengthen the thin acetabulum. In this case the compression of the nerve was so tight that recovery would have been impossible without surgery. In 2 cases a lesion, probably caused by a retractor, was found in the femoral nerve; and the nerve was surrounded by scar tissue.

The final result after 5 (1–10) years was satisfactory in all except the cement case. The patient regained good function of the quadriceps muscle, and they were free from pain regarding the area of the femoral nerve. However, 1 of the 2 unoperated on patients later fell and sustained a femoral fracture due to the weakness of her quadriceps muscle. This shows that this patient probably should have been operated on.

Conclusions: A femoral nerve lesion after hip arthroplasty can recover spontaneously. Operative treatment is simple. It is indicated if there is no evidence of recovery within 2 months.

Fractures of the femoral shaft in children: An epidemiologic study

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The purpose of this study was to determine the age- and sex-specific incidence rate and the cause of the femoral shaft fracture in children and adolescents 0–15 years of age.

Patients and methods: Totally, 114 patients suffering from a femoral shaft fracture were treated in Kuopio University Central Hospital from 1976 through 1985. The patients were selected from a computerized medical information register. The cause of the fracture was identified by the E-code.

Results: There were 82 boys and 32 girls, with a ratio of 2.6:1. The incidence was 2.2 per 10,000 inhabitants 0–15 years of age at risk in Kuopio province. The fractures caused by falls were the most common fractures in children younger than 5 years of age. Traffic accidents were the most common cause of the fractures in both sexes at 6–9 years of age. A typical adolescent male patient was injured by a motorcycle in a traffic accident. No correlation between the dominant arm and the injured femur was found. The peak incidence of the fractures was in February and March.

Conclusion: The different causes of the fractures in children at the various ages indicated that environmental factors are the most important risk factors in this kind of fracture.

The relation between inflammatory joint disease and patient personality

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We measured the pain tenderness threshold at 16 fibrositic tender points in 44 rheumatoid arthritis patients using a dolorimeter. Pressure threshold measurements were transformed to z-units to equalize the weights of the values at different anatomic sites and then summed up. This pain tenderness score correlated well with the joint score index ($P < 0.002$, $r = -0.363$), signifying a low threshold in the patients with a high joint score index. Tender points were clustered around the inflamed joints. In contrast to this, the pain tenderness score was not explained by either personality factors (general pain or sensory arousal activity, strength of the emotions experienced in general or tendency to have somatic reactions in emotion-loaded situations) or the generalized disease activity measuring parameters (erythrocyte sedimentation rate, C-reactive protein).

Our results show that the trigger point tenderness is real in RA, and that the tenderness is augmented especially near the active joints. The pain tenderness score of RA patients fulfills the conditions of a linear, normally distributed parameter. It is not affected by the subject's personality, and it seems to be a useful method for assessing fibrositic symptoms.

Repair of the totally dislocated acromioclavicular joint using transarticular fixation with Knowles' screw and ligamentous reconstruction

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The aim of the operative treatment of acute major dislocation of the acromioclavicular joint is to prevent late upward displacement of the lateral end of the clavicle and the unpredictable degree of disability. A variety of procedures are available. Suture of the acromioclavicular capsular ligament alone is ineffective.

Material and methods: Fifty-five totally dislocated acromioclavicular joints were operated on within 2 weeks after the accident. Besides stabilization with Knowles' screw and suturing of the disrupted ligaments in 26 instances, the coracoidal attachment of the coracoacromial ligament with a flake of bone was transpositioned to the clavicular end in order to reinforce the acromioclavicular ligament.

Results: Evaluation of the clinical and radiographic findings at follow-up, on the average 6 (1–13) years after the operation, showed at least a satisfactory result in 50 cases, while 5 were classified as less satisfactory. Ligament transfer did not improve the outcome. The results were significantly less favorable in patients over 50 years of age. The main reason for failure was slight to moderate pain on movement. Asymptomatic resubluxation was common.

Conclusions: Stabilization of the acromioclavicular joint after reduction with a Knowles' screw and ligamentoraphy is a method as favorable as most other procedures designed for this condition. Whether an elderly patient should have operative or conservative treatment is not obvious. A cosmetically faultless result cannot be guaranteed in either case.

Proximal dislocation of the patella with large osteochondral fragment: A report of 3 cases

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Three cases of proximal dislocation of the patella with large osteochondral fragments in young male adults are presented. Usually osteochondral fractures of the patella occur when the displaced patella reduces over the high lateral lip of the femoral trochlea during extension. In the proximal displacement the patella is fractured directly against the lateral lip of the femoral trochlea. This mechanism produces large osteochondral fragments, which may consist of the whole medial facet of the patella.

One of the cases was left untreated and developed a moderate arthrosis of the knee during a 5-year period. The fragment, 35 x 25 x 15 mm in size, was removed, and the realignment of the patella was performed using lateral release and Krogius tenoplasty. After a 2-year follow-up period, the patella was still in a position of slight subluxation.

Two cases were treated immediately after the injury. The size of the fragment was 25–30 x 20 x 6 mm. In both cases the fragment was glued with a fibrin adhesive. The patella was reduced using a lateral release combined with an augmentation of the capsule with the duplication of the cut margins of the medial capsule. Both knees were immobilized in a plaster cylinder for 6 weeks. Radiographically an anatomic incorporation of the fragments and a good position of the patellae in the femoral sulcus were observed after that time. Clinical results were good in both cases, but 1 of these patients needed an arthroscopic resection of a cartilaginous extension overlapping the glued juncture.

Fibrin adhesive sealant seems to be suitable in fixing large osteochondral fractures of the patella.

"Treatment injuries," calculated risks or poor outcomes?

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The Treatment Injury Compensation Act came into force in Finland in May 1985, and by December 1988, a total of 3,722 claims had been received, of which a judgement had been given in 3,179 cases, with 40 percent to the patient's benefit. A marked increase has taken place more recently, however, in that a total of 901 applications were made regarding surgical procedures alone in the first 3 months of 1989, including 357 (25 percent) orthopedic cases, of which 283 (80 percent) were due to infections.

Treatment injuries characteristically involve the inflicting of bodily harm; they are associated with examinations, treatment or neglect of treatment, are related to an infection acquired during treatment, arise from an accident occurring during treatment, arise from transportation, or result from a technical fault of some kind. On the other hand, no treatment injury can be held to have arisen in cases where a medically justifiable procedure led to consequences that could not have been avoided by the choice of some other potentially equally effective modality as far as the patient was concerned. The one exception to this rule is injury from infection. Similarly, awards cannot be made with respect to a deterioration in the patient's condition that went untreated due to limited nursing resources.

The principle is followed that no error or negligence need be proved provided that the case otherwise meets the conditions for a treatment injury. This insurance system guarantees that the patient receives adequate compensation for injuries suffered without recourse to expensive, exhausting, and unnecessary legal proceedings. A high proportion of the applications for compensation arise from operative procedures.

The system calls for cooperation on the part of physicians and surgeons, and recognition of the fact that if one

takes positive action there is always a chance that something will go wrong. The adjudicating board adopts the point of view of the patient when reaching its decisions, and in this way involuntarily becomes a determinant of treatment norms.

Discision of plantar fascia for plantar fasciitis

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Plantar fasciitis is a syndrome of pain and tenderness at the plantar aspect of the heel. Conservative treatment is usually effective, but resistant cases have been treated with surgery. We report a survey of 51 patients treated with discision of plantar fascia combined with excision of the calcaneal spur.

Patients and methods: The median age of the patients (7 males, 44 females) was 44 (16–64) years, and the median follow-up was 9 (0.5–17) years. The median preoperative duration of symptoms was 2.5 (0.5–28) years, and conservative treatment mainly consisted of an average of four local injections of corticosteroids. Two of the patients were active runners and 14 were joggers, whereas the remaining patients had no sports activities.

In 37 preoperative radiographs, a calcaneal spur was seen.

Results: At the follow-up examination a normal foot was seen in 28 cases while 6 cases had flatfeet, 6 cases had hallux valgus, 11 cases had plantar callosities, and 1 case had plantar fibromatosis. Some tenderness at palpation over the calcaneal tuberosity was found in 11 cases. The radiographs revealed 26 calcaneal spurs.The spur had recurred after excision in 7 cases.

The result was excellent (no pain) in 31 cases, good in 19 cases, and poor in 1 case.

Conclusions: Discision of plantar fascia with or without excision of the calcaneal spur is a good method for treating cases with plantar fasciitis resistant to conservative therapy, and the good results seem to be permanent.

Fixation of distal femoral physeal fracture with self–reinforced poly-l-lactic acid (SR-PLLA) pins: An experimental study on growing rabbits

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Polyactic acid (PLA) undergoes in vivo hydrolytic de-esterification into lactic acid, which is incorporated into the tricarboxylic acid cycle. The present study concerns the biodegradation and fixation properties of the isotactic L-polymer of PLA (PLLA) in growing bone.

Material and methods: Self-reinforced poly–L-lactic acid (SR-PLLA) implants (diameter 1.1 mm, length 25 mm) were manufactured of medical grade PLLA. Experimental physeal fracture of the right distal femur was made in 21 five-week-old rabbits. After accurate reduction, the physeal fracture was fixed with two SR-PLLA pins (diameter 1.1 mm). The follow-up intervals were 3, 6, 12, 24, 28, and 56 weeks. The distal femoral growth plate of both femurs was analyzed by radiographic, microradiographic, oxytetracycline-fluorescence, and histologic studies.

Results: After 3 weeks, all the experimental animals were able to walk without lameness. The transphyseal biodegradable fixation resulted in rapid healing of a physeal fracture without any residual deformity or growth disturbance. Histologically, the SR-PLLA implants were seen in all the specimens at 56 weeks. The SR-PLLA pins retained their shear strength exceeding that of growing bone over 24 weeks.

Conclusion: The SR-PLLA pins provided sufficient stability for rapid healing of an experimental physeal fracture in growing rabbits and did not cause any growth disturbance. Remarkable remnants of SR-PLLA implants still persisted at 56 weeks, indicating a slow biodegradation rate of the material. The good strength retention and the slow biodegradation rate could be of benefit in conditions where a transphyseal fixation of long duration is needed.

Excision of the lunate in Kienböck's disease

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After excision of the lunate for Kienböck's disease in 7 females and 15 males, most of the patients, who were followed up for almost 7 years, were able to continue with their heavy manual work and activities in spite of the fact that the dominant hand was affected in 16 cases. Only 2 patients had a secondary operative procedure. Carpal changes were less than anticipated. The excision of the lunate is an easy procedure for the patient without serious complications. As previously suggested (Kawai et al. 1988), elderly patients and nonmanual workers are good candidates for excision of the lunate; but, on the basis of our study, heavy manual workers are qualified, too (See Table 1).

Table 1. *Results after excision of the lunate (n 22)*

Wrist's condition	*N*	Symptoms before operation	Average	Follow-up
No pain	11	3.2 years	40	8.2
Slight pain in heavy use	4	1.8 years	42	3.8
Pain during light work	5[1]	0.6 years	43	6.6
Arthrodesis	2	1.1 years	38	1.5[2]

[1] Four patients changed to less strenuous work.
[2] Before arthrodesis.

Reference

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