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TRANSPLANTATION OF COMPOSITIVE GRAFTS OF BONE MARROW AND BONE MATRIX

An experimental study

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Allogenic demineralized cortical bone transplants with autogenous bone marrow were implanted into the abdomianl muscle wall of rats and observed for 4 weeks, whereupon the implants were examined using roentgenography, histometry and ^{45}Ca labeling. Compositive grafts turned out to produce a greater amount of new bone than the sum of bone produced after 2 weeks by the components *per se,* while equal amounts were found in demineralized matrix as well as in compositive grafts after 4 weeks. However, dissociated bone marrow combined with demineralized cortical bone matrix significantly induced more new bone than the combination with whole bone marrow. The observation indicates that some bone marrow cells (a stromal cell population) respond to bone matrix and that a component of bone matrix (a bone morphogenetic protein) induces both bone marrow cells and connective tissue derived cells to differentiate into new bone.

HYALURONIC ACID TREATMENT OF POSTOPERATIVE JOINT STIFFNESS

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Joint stiffness following surgical synovectomy of the rheumatic knee is not unusual. Most authors suggest mobilization under anaesthesia if the range of motion does not exceed 70–90° one week postoperatively. This mobilization is often followed by pain that may restrict or even prevent exercise of the knee. In 1 year we had nine patients out of 52 with surgical synovectomy of the knee, who had severely restricted range of motion 1–8 weeks postoperatively. The age of the patients varied between 15–70. Most of them seemed to be very sensitive to pain. No other explanation for the restricted joint motion was found. Under general anaesthesia 6–10 cm^3 of hyaluronic acid was injected into the knee followed by very gentle manual mobilization. All knees reached at least 90° by this procedure. This range of motion could be retained postoperatively without problem. The duration of the effect of the injection seems to be 5–7 days which is enough to allow consolidation of the range of motion. No complication was seen. The hyaluronic acid was given as Na-hyaluronate, 10 mg/cm^3 (Healon, Pharmacia Inc.).

KINETEC – AN AID TO BETTER POSTOPERATIVE MOBILITY TRAINING

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Kinetec is a power-operated device to train hip and knee mobility. We have used the device postoperatively for patients treated with knee and hip arthroplasty, synovectomy, leg lengthening, operations for femoral fracture, etc. Its essential feature is a power-driven, adjustable, jointed support for the patient's leg which is manipulated by a switch to provide a complete flexion/extension circuit within 36 seconds or to arrest the leg in any desired position. The advantages of the Kinetec method are that effective and continuous training can be initiated immediately after operation and that the device can be operated by the patient himself, which allows more frequent training. The patient is stimulated by being able to manage part of his mobility training himself and is more relaxed and less reluctant because training is less painful.

It should be stressed that this method should naturally be complemented by active exercises to train muscular power and function.

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ICLH-ARTHROPLASTY OF THE KNEE IN RHEUMATOID ARTHRITIS: 2–7 YEARS EXPERIENCE

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The ICLH prosthesis has since 1972 been used exclusively for replacement of severely damaged knees due to rheumatoid arthritis. The follow-up period was from 2–7 years. The study was performed as a prospective longitudinal study, in which a detailed protocol was filled out preoperatively and once a year thereafter. A total of 66 arthroplasties were performed on 59 patients, 51 women and 9 men. The age range was from 40–82 years (mean age 60 years). Seven patients had both knees replaced. Pain was the main indication for surgery and the results with respect to pain and functional abilities were analyzed. Relief of pain was the most gratifying and consistent finding over the follow-up period. Residual mild pain was almost exclusively located anteriorly in the knee and was believed to originate from the patello-femoral articulation. Late complications were present in 18 per cent, but the majority of these (60 per cent) resolved after various forms of treatment. In 15 per cent of the patients different kinds of reoperations were performed and 10 per cent had a revision arthroplasty. Altogether we have observed 6 per cent permanently poor results in this series of 66 knee arthroplasties. The reason for the poor results was either infection, instability and/or deformity, or an inability to position the prosthesis accurately at the time of the operation. The most important mistake was that the tibial component was too small and lacked cortical bone support and consequently subsided into the tibia over the years.

PENETRATION OF FLUCLOXACILLIN TO SPONGIOUS AND CORTICAL BONE DURING KNEE ARTHROPLASTY

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An initial, methodological study was performed in rabbits. 50 µg (approx.) blocks of spongious and cortical bone not contaminated with surrounding blood were incubated in PBS-buffer for 24 hours at 4°C. After diffusion, the concentration of flucloxacillin was determined using Tg-agar with *B. Stearotemophilus*.

In 23 adult patients undergoing knee endoprosthetic surgery, 2 g flucloxacillin was given intravenously about 2 hours before operation. No tourniquet was used. Serum samples were analyzed before and 30, 60, 120 and 360 minutes after the antibiotic administration. At operation, the mean concentration of flucloxacillin in synovial fluid was 13.4 µg/ml (range 4.3–21.0); in synovium 3.0 µg/g (0.4–13.3); in spongious bone 2.0 µg/g (0.3–5.7) and in cortical bone 1.3 µg/g (0.2–4.2). Almost all patients showed bone concentrations of flucloxacillin higher than or equal to the MIC value of 0.25 µg/g against *Staph.aureus*.

These results indicate that antibiotic prophylaxis ought to be used if postoperative infections cannot be kept below or around 1 per cent by other means.

REOPERATIONS OF TOTAL HIP REPLACEMENTS IN SWEDEN 1979

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In a multicenter clinical study of reoperations after hip replacements, data were presented from 39 out of 42 Swedish Departments of Orthopaedic Surgery. 426 reoperations had been performed on 355 patients, about 8.3 percent of all hip arthroplasty operations.

Infection was the indication in about 25 percent of the cases; mechanical loosening in 50 percent. The reoperation was a change of one or both components in about 65 percent, while in 9 percent the components were removed, and in 18 percent a repositioning was done after dislocation.

OSTEOSYNTHESIS WITH THE WILLIAM SCREW

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After some therapeutic "adventures" with the Rydell nail for osteosynthesis of femoral neck fractures we decided in 1977 to try another method of osteosynthesis. We chose the William screw which like the Rydell nail provides compression over the fracture line. The same screw can also be used for trochanteric fractures, together with a plate, as a "sliding nail".

Because of delivery difficulties caused by the British strikes we have up to now only done 40 osteosyntheses with the William screw but we hope that the series will soon be much larger. We plan to investigate the series and give a preliminary report to the Orthopaedic Meeting during "Riksstämman" in Stockholm Nov–Dec 1980.

Our first impressions of the method are that it is a simple method of osteosynthesis with a short operation time and we intend to continue the use of the William screw for femoral neck fractures.

RADIOGRAPHY OF TOTAL HIP REPLACEMENT

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Diagnostic efforts are facilitated by standardization of the roentgen examination of the hip and pelvis, and by always comparing the radiograms with the first and the last examination. Abnormalities related to the socket always include an increasing bone-cement lucency and /or a change in position, irrespective of the cause.

At the upper end of the femur, an isolated separation at the metal-cement interface is the result of mechanical failure. However, secondary bone reaction may mimic infection. A widespread or localized bone resorption at the bone-cement interface, pronounced calcar resorption and an irregular periosteal reaction are changes predominantly observed in conjunction with deep infection. However, a definite conclusion on the basis of the radiograms alone should be avoided – always correlate with the clinical and laboratory data.

LOW VIRULENT INFECTION IN TOTAL HIP REPLACEMENT

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Twenty total hip replacements subjected to revision were studied roentgenographically; with gallium and technetium scans; histologically and bacteriologically. Loosening was obvious in most cases. All cases examined showed particles of polyethylene or methylmethacrylate in granulomas around the components. Microradiography revealed bone resorption cavities around these granulomas. In six hips peroperative cultures revealed *convincing* bacteriologic evidence of a low virulent infection, the causative organisms being *Staph. epidermidis* and *Propionebacterium acnes*. Clinically these infections could not be diagnosed with certainty. In four cases however the bacteria were isolated from the preoperative joint aspiration. In addition the ESR was raised in most cases compared with the value before the first operation and the post-revision value. The gallium scan was negative in all these cases. Another five hips had occasional positive cultures of low virulent strains taken at surgery whereas eight hips were found to be sterile. In all cases a new total hip prosthesis was cemented in with Palacos c. Gentamicin (Schering Corp.). Lincomycin was given for 10 days after the surgery. With this treatment a low virulent infection did not seem to alter the good prognosis for this group of revised total hips. A low virulent infection may be one of many factors contributing to failure of total hip replacement ultimately diagnosed as prosthetic loosening.

ROUTINE-SCREENING FOR THROMBOSIS AFTER HIP SURGERY

Effect of graded compression

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The usefulness of the Fibrinogen uptake test (FUT) as a routine screening method for postoperative thrombosis after hip surgery was evaluated in 84 patients given Dextran prophylaxis. The sensitivity of the test was found to be too low in patients with hip fractures.

A prospective, randomized trial on the effect of graded compression was done in 62 patients operated on electively. Graded compression lessened the number of positive tests by 60 per cent ($P<0.01$). A significant reduction was only seen in men ($P<0.01$).

Seventeen out of 21 FUT-positive patients were analysed by phlebography. A tendency towards a higher specificity of FUT was seen when graded compression was used.

It is concluded that if a more individualized approach to prophylaxis is chosen, prospective screening is needed. As a routine screening method, FUT has several advantages. It is a fast and easy method and should be well suited for screening after elective hip surgery.

CHRONIC LOW BACK PAIN BEFORE THE AGE OF 50

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Fifty-two patients with a minimum sickness absence period of 3 months were evaluated with respect to clinical, psychological, work-related, and social factors, in an effort to identify factors of prognostic importance.

The clinical findings were few. The intellectual capacity of the patients was normal. Dissatisfaction and tiredness at the end of the work day were common. Most of the patients had heavy physical work, and unemployment was frequent. Previous work absenteeism under diagnoses other than low back pain was common. The social situation was on average less satisfactory than in the general population. The patients are now being followed up 1 year after treatment.

BACK PAIN IN MEN, 40–47 YEARS OLD

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716 men of a random population sample of 945 were

studied with respect to low back pain (LBP), work place factors, stress factors, and the occurrence of internal diseases and abnormalities. 438 (61 per cent) had previous or present LBP and/or sciatica. 225 had complaints at the time of investigation (31.5 per cent). Heavy physical work, lifting and repetitive work were more common in those with LBP than in other subjects, while no difference was found as regards work satisfaction or type of employment.

CHOICE OF ANAESTHESIA FOR OUTPATIENT ARTHROSCOPY

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A total of 273 patients who had earlier undergone arthroscopy as an outpatient procedure were contacted and asked for their opinion of the anaesthetic procedure used. 72 out of 74 (97 per cent) who had general anaesthesia were completely satisfied. 81 out of 143 (57 per cent) given spinal, anaesthesia were satisfied; 16 had to be put to sleep due to insufficient anaesthesia and 17 complained of headache more than 1 day after the procedure. 24 out of 56 (43 per cent) had no complaints about local anaesthesia with our particular technique. None of these patients had to be put to sleep, however. Although general and spinal anaesthesia have a higher patient acceptance they require the assistance of an anaesthesiologist and hence prolong the procedure.

During the local anaesthesia we fill the knee joint with 50–60 cm^3 of 0.5 per cent prilocaine or lidocaine with adrenalin and wait 4–5 min before introducing the arthroscope through an infiltration of the skin and underlying tissues. When the arthroscope is inside the joint we distended it with a mixure of 10 cm^3 of 0.5 per cent prilocaine with adrenalin and 40 cm^3 of physiological saline. If we need to inject more physiological saline into the joint we use the same mixture of saline and local anaesthetic. During a typical arthroscopy (often including some transarthroscopical surgery) we use altogether around 500 mg of prilocaine.

We have also tested the blood concentrations of the local anaesthetic used and found them to be very safe and 50–80 times lower than an accepted blood level. This is most likely due partly to slow absorption and partly to the fact that most of the local anaesthetic is washed out after the procedure.

During the last 2 years most of our arthroscopies have been performed under local anaesthesia. It is a safe and reliable method that allows the patient to return home immediately.

A COMPARISON BETWEEN ARTHROSCOPY AND ARTHROGRAPHY OF THE KNEE

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Arthrography has previously been the routine method of diagnosing intraarticular injuries. Several recent studies have shown a very low accuracy of arthrography (50–60 per cent). Several of these studies have been done in centres where someone has been very interested in arthroscopy and has compared his results with the routine arthrography. We have therefore asked a very experienced radiologist to re-examine 87 arthrograms performed in patients who have also undergone arthroscopy and arthrotomy. In a few cases they were not operated upon, but have been followed for several years clinically. Our experienced radiologist, however, was only correct in 52 per cent of the arthrograms. He pointed out, though, that 45 per cent of the arthrographical examinations were of such poor quality that it was impossible to do a complete evaluation of them. If the arthrograms were restricted to the medial meniscus his accuracy was 86 per cent. Arthroscopy in our series had an accuracy of 93 per cent. Most of the failures were overlooked ruptures of the posterior horn of the medial meniscus. A combination of arthroscopy and a "limited" arthrogram of the medial meniscus would thus give a very high accuracy approaching 100 per cent.

CLINICAL VALUE OF CONVENTIONAL X-RAY EXAMINATION IN INFLAMMATORY AND DEGENERATIVE DISEASES OF THE SHOULDER JOINT

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The clinical value of conventional X-ray examination was analysed in inflammatory and degenerative diseases of the shoulder joint. In a retrospective study all patients were included who were admitted to our department in 1 year. X-ray examination was performed in 93 out of the 208 patients.

Thirteen per cent of the X-ray examinations were of importance for the diagnosis or the therapy. The clinical value of X-ray examination is thus limited in this patient category. This result could be expected since these diseases affect the periarticular soft tissues. These structures are difficult to evaluate by conventional X-ray examination. The indications for X-ray examination can certainly be made stricter without negative consequences for these patients.

AN IMPROVED METHOD FOR SURGICAL TREATMENT OF HALLUX VALGUS

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The majority of currently used methods of operation for hallux valgus involve considerable postoperative pain and discomfort during a long healing period. This may be the result of instability at the site of an osteotomy or articular pain as a result of surgical trauma to the mtp joint. By fixating the fragments after an oblique osteotomy using a small compression screw the following effects can be achieved: Complete stabilization, control of the displacement (medially, plantarwards and proximally) and control of dorsal angulation in cases with a low grade hallux rigidus. No plaster bandage need be used. Patients can be allowed to bear weight on the heel and the lateral side of the foot from the first postoperative day. After 4 weeks full weight-bearing can start and at 6 weeks postoperatively even heavy work may be allowed. Twenty-three feet have been operated on by us with this method. Our impression has been that postoperative suffering has been minimized. A follow-up after a postoperative period raging from 3 years and 6 months to 6 months shows excellent functional results. The use of a metallic implant is a disadvantage in young patients so we have extracted the screw under local anaesthesia.

OSTEOSARCOMA: AN ELECTRON MICROSCOPIC STUDY

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The cells in each of six osteosarcomas were analyzed by electronmicroscopy. Four different cell types were consistently observed in the investigated tumours, i.e. osteoblast-like, fibroblast-like and macrophage-like cells as well as multinucleated giant cells. In addition occasional unclassifiable cell types were also noted.

The fibroblast-like and osteoblast-like cells commonly exhibited atypical nuclei and intranuclear pseudoinclusions. These cells also contained a well developed, often dilated endoplasmatic reticulum. The latter finding in connection with the absence of glycogen deposits is indicative of a high rate of protein synthesis and thus of a high proliferative activity, which is a common feature of neoplastic cells.

The multinucleated giant cells showed a well developed vacuolar system, rather abundant lysosome-like structures and an extremely large amount of mitochondria. No brush borders were observed which may indicate that giant cells are not osteoclastic in nature. The histogenesis of the multinucleated giant cells could not be determined, but the close contacts between individual osteoblast-like cells on the one hand and between these cells and the multinucleated giant cells on the other hand may suggest a fusion mechanism.

ORTHOPAEDIC APPLICATIONS OF SERIAL CRYOSECTIONING

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To circumvent the artifacts inherent in conventional macrosectioning, musculoskeletal specimens containing undercalcified bone may be sectioned through on a heavy-duty cryomicrotome.

After thawing of the disturbing ice crystals on the freshly cut surface of the specimen, a truly undistorted cross-sectional image is revealed. The surface image has deep and natural colours and minor anatomical details can be seen with high resolution. Flash photography at constant magnification and with equidistant cutting-height intervals permits a meticulous three-dimensional assessment of morphologically complex lesions involving calcified tissues.

This modified technique lends itself to examinations of orthopaedic tumours and of functional anatomy and to analyses of experimentally provoked dislocations of joints. Moreover, it is of value for producing cross-sectional images that correlate exactly with conventional and computer tomograms as well as with ultrasonograms.

Cryosections may of course be obtained for histological, autoradiographic, histochemical and electron microscopic investigations, including X-ray microanalysis.

EDUCATION IN EMERGENCY CARE: ROLE OF THE ORTHOPAEDIC SURGEON

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The prognosis of injuries to the skeletal system depends to a great extent on the first aid given to these injuries. To improve the emergency care carried out by ambulance personnel, the education should stress the utmost importance of the examination, and of the generous use of board splints and folding type stretchers in the care of spinal injuries. For dislocated fractures the instructions should indicate the proper alignment of fractures prior to splinting. The engagement of the orthopedic surgeon in this section of the education of medical technicians and ambulance personnel is further emphasized.