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EDITOR: A. ALHO

ELECTRICAL STIMULATION OF FRACTURE HEALING

A. J. Aho, H. Aro & T. Ekfors
Department of Surgery and Department of Pathological Anatomy,
Turku University Central Hospital

We examined the effect of asymmetrical alternating current on the bone healing process in the rabbit antebrachium. The voltage supplied simulated a physiological pattern of stress-generated electrical potentials in bone. A transistorized multivibrator (Ollituote Oy, Finland) delivering asymmetrical alternating current was used. The current supplied had positive and negative peaks (+ 22 μA and — 18 μA in the radius group, + 100 μA and — 100 μA in the ulna group) and a small unidirectional current (+ 2 μA in both groups). The frequency was 0.8 Hz, pulse duration 8 ms and voltage limit 1 V.

In the radius group the current was led into the osteotomized bone with teflon-insulated platinum-iridium leads. In the ulna group the osteotomy site was externally transfixed with two Kirschner wires which were used as electrodes. In the two stimulated groups histological studies revealed an activated osteogenesis near the electrodes, particularly in the periosteum, which was more pronounced than the reaction at the fracture site. Both electrodes induced osteogenesis. In the control groups the osteogenic reaction around the electrodes was either minimal or else non-existent.

A COMPARATIVE STUDY OF THE OSTEOGENETIC CAPACITIES OF FREE PERIOSTEAL AND OSTEOPERIOSTEAL GRAFTS

M. Poussa & V. Ritsilä
Orthopaedic Hospital of the Invalid Foundation, Helsinki

Earlier studies have shown that free periosteum, stripped from the tibia with a scalpel, has a strong osteogenetic capacity (Ritsilä et al. 1972, *Scand. J. Plast. Reconstr. Surg.* **19**, 19). Periosteum alone and periosteal grafts attached to 200 μ thick cortical bone were grafted from the tibia to a lumbar vertebra in 6-week-old rabbits. The grafts were fixed bilaterally in the same vertebra between the spinous and mammillary processes. The rabbits were killed 3, 7, 14, 21, and 28 days later and osteogenesis was examined histologically. It was found that freely stripped periosteum had better osteogenetic power than the 200 μ thick osteoperiosteum. The new bone was formed by the osteogenetic cells of the cambium layer. In the present study the osteoperiosteal grafts were relatively thick. A further study using thinner grafts is being performed.

ENDOPROSTHETIC REPLACEMENT OF THE KNEE JOINT

Pär Slätis & Uolevi Kankaanpää
Division of Orthopaedic Surgery and Traumatology, Surgical Clinics, Helsinki

Twenty-one patients with rheumatoid arthritis and eight patients with osteoarthritis of the knee were treated with an endoprosthetic replacement of the deranged joint surfaces. The main indications, in addition to pain, were severe lateral instability in nine knees and flexion contracture ranging from 20 to 50° in 19 knees. Two types of prostheses were used; viz., the Geomedic and the Marmor modular knee. Follow-up averaged 12 months. Arthroplasty provided almost complete relief of pain in 20 patients, corrected lateral stability in seven out of nine unstable knees, and relieved completely the flexion contracture in 11 out of 19 knees. The average range of movement increased from 78° preoperatively to 90° at follow-up.

ARTHROPLASTY OF THE KNEE JOINT WITH SPECIAL REGARD TO COMPLICATIONS

V. Vahvanen
Aurora Municipal Hospital, Helsinki

A study of arthroplasty of 73 knee joints was made with an average follow-up of two and a half years. All operations were performed by the same orthopaedic surgeon in the department of general surgery. Modular and polycentric prostheses were used in most cases and the average age of the patients at the time of the operation was 60 years. Most had rheumatoid arthritis. The rate of deep infection was 5.5 per cent (four cases) and that of failure 18 per cent. Fractures of the prosthesis or bone were found in five knees. All the fractures were in the medial compartment of the knee joint. Loosening of the prosthesis without infection or other complications was found in three cases, all of which became apparent within 1 year of the operation. All failures were reoperated on. An arthrodesis was performed on seven knees, i.e., on about 10 per cent. These knees were evaluated as poor at the late follow-up stage. The prosthesis of five patients was changed and one knee was treated by closed irrigation. All infections healed during the follow-up. The best results were achieved with the Geomedic and St. Georg Schlitten prosthesis models.

OPERATIVE TREATMENT OF THE RHEUMATOID CERVICAL SPINE

Uolevi Kankaanpää
Division of Orthopaedic Surgery and Traumatology, Surgical Clinics, Helsinki

Rheumatoid arthritis more often involves the upper than the lower part of the cervical spine. In the upper cervical spine dislocation is caused mainly by ligamentous destruction. Because of the large upper medullary canal the subluxation seldom results in medullary symptoms. Radicular pains are, however, quite common. In the lower cervical spine dislocation is caused by bony destruction of articular facets. Because of the narrower lower medullary canal even slight dislocation may be dangerous.

Since 1972, 28 patients have been operated on at Rheuma Foundation Hospital, Heinola, and Surgical Clinics, Helsinki. Brattström's method of occipito-axial fusion with cement and bone was used in 14 cases (Brattström & Granholm 1973, *Orthopäde* **2**, 118–120). Gallie atlanto-axial fusion was performed in seven patients. The remaining seven patients suffered from C3-C6 dislocations. They were operated on using Rogers' method, i.e., simple bone transplantation or laminectomy plus lateral fusion.

One tetraplegic patient showed no improvement, whereas the two tetraparetic patients recovered almost completely. At the follow-up of 23 patients their subjective evaluation of the result was good in 15, fair in 5, and unimproved in 3. Two complications were recorded: one infection (necessitating the removal of cement 6 months later) and one broken wire between the atlas and cord (with no medullary injury, but requiring removal of the wire).

There seems to be an increased tendency for the occurrence of lower cervical dislocations 4–5 years after occipito-axial fusion.

STRESS HORMONES, LIPIDS AND COAGULATION IN TRAUMA PATIENTS WITH AND WITHOUT FAT EMBOLISM. A COMPARATIVE STUDY 1 YEAR AFTER SEVERE TRAUMA

V. Avikainen, K. Willman & P. Rokkanen
Orthopaedic Department, Central Hospital of Central Finland, Jyväskylä

The question of why some patients develop fat embolism syndrome (FES) while others with similar injuries do not remains unsolved. Ten patients with FES were compared with 10 patients with similar injuries without FES at least 1 year after trauma. The following blood tests were performed: Hb, leucocytes, platelets, protein and lipid electrophoresis, ACTH, cortisol, TSH, HGH, insulin, glucose, NEFA, certain coagulation studies, α-antitrypsin and antithrombin III. In FES, platelet counts were higher especially after ergometric stress ($P < 0.01$). More numerous petechiae were observed in the FES group in a Rumpel-Leede stasis test. Cholesterol was somewhat higher in FES and the alpha/beta ratio in lipoprotein electrophoresis somewhat smaller. Cortisol was lower after stress in the control group ($P < 0.05$). Low GH values were observed in the FES group ($P < 0.05$). Blood glucose was pathological in three patients in the FES group and the values rose after ergometric stress while in the control group glucose was normal in all and decreased after stress in most. Half the patients with FES had a familial history of diabetes against none in the control group. Urinary catecholamines were somewhat higher in FES but the reaction to stress was similar in both groups.

PSEUDARTHROSIS OF THE CLAVICLE

J. Joukainen & E. Karaharju
Division of Orthopaedic Surgery and Traumatology, Surgical Clinics, Helsinki

Fractures of the clavicle are usually treated conservatively. If the fracture remains unhealed, and a painful pseudarthrosis develops, an operation may be indicated. At the Surgical Clinics five patients with pseudarthrosis of the clavicle

were operated on during the period 1974–1976. The mean age of the patients was 29.8 years and the time interval between the trauma and surgery was more than 3 years. The pseudarthrosis was in each case located in the middle third of the clavicle. The indication for surgery was pain. A skin incision was performed craniocaudally to avoid damaging the cutaneous nerves. The ends of the pseudarthroses were renewed and the reposition fracture was fixed with AO semitubular plates and cancellous bone transplants from the iliac crest. It was possible to treat a 1-inch defect successfully without bone interposition. Postoperative immobilisation was maintained with a collar and cuff for 3 weeks. All operated pseudarthroses consolidated and the patients returned to work within 2 months of the operation. In primary treatment of fractures of the clavicle the conservative method gives good results in most cases, and in the treatment of pseudarthrosis an AO semitubular plate with cancellous bone transplantation is recommended.

EARLY COMPLICATIONS OF DISLOCATION OF THE HUMERUS

M. Pasila, H. Jaroma, O. Kiviluoto & A. Sundholm
Department of Orthopaedics and Traumatology, Helsinki University Central Hospital

Complications of traumatic dislocation of the humerus during the period 1973–1976 were analysed in a prospective study. The clinical examination was first made in the emergency department and later repeated in the department of physiotherapy. The function of the rotator cuff, peripheral pulses, and motor and sensory function of the upper limb were examined.

Sixty-three patients out of 238 (26 per cent) showed the following associated lesions: brachial plexus 29, rotator cuff 28, and axillary nerve 21. Complications were more frequent in the age group over 50 years ($P < 0.001$) and in patients performing manual labour as opposed to those performing intellectual work ($P < 0.05$). If the humerus was dislocated for longer than 12 hours the frequency of complications was higher ($P < 0.01$).

The importance of early reduction is emphasized.

INTERCONDYLAR Y-SHAPED FRACTURES OF THE HUMERUS

Vappu Uuspää
Department of Orthopaedics and Traumatology, Helsinki University Central Hospital

158 patients aged 15–90 with 159 intercondylar Y-shaped fractures of the humerus were treated during the period 1960–1972. Two thirds of the 91 female patients were 55–90 years of age; almost half of the male patients were aged 15–35 years. 114 patients with 115 fractures were reexamined, the average follow-up period being four and a half years. According to the Riseborough-Radin classification there were 24 cases of type I, 44 cases of type II, 44 cases of type III, and 27 cases of type IV fracture. The female patients had had low-energy accidents (falling), the male patients mainly high-energy accidents (working, traffic). One fracture in four was open. Four primary nerve injuries were noted. 80 patients were treated conservatively; closed reduction and plaster cast immobilization or skeletal traction and plaster cast were used. 78 patients were treated operatively, 34 cases within the first 24 hours. A great variety of fixation methods were used: Vitallium screws and plates, and Kirschner wires were used throughout the whole period, with AO-osteosynthesis being the most popular method in the latter years. 19 cases of postoperative nerve injuries were observed. 10 patients developed chronic fistulation and five of them had open fractures. Five cases of pseudarthrosis were noted, two of them after conservative treatment.

TREATMENT OF FUNCTIONAL DISORDERS AFTER MALPOSITION OF FRACTURES OF THE DISTAL RADIUS

K. A. Solonen & T. Telaranta
Orthopaedic Hospital of the Invalid Foundation, Helsinki

Eighty-six patients with malposition after a fracture of the distal radius are reviewed. The patients initially had conservative treatment at different out-patient departments. The deformity was observed to limit movement of the radioulnar joint, but movement of the radiocarpal joint was also restricted in most of the cases.

Depending on the degree and the nature of the deformity and the limitation of joint movement, two methods were used. The worst deformities were corrected by a distal wedge osteotomy of the radius according to the angulation. The distal fragment was fixed in the corrected position with two Kirschner wires. Most frequently a modified Darrach procedure was included in the operation; the length of the ulna resected did not exceed 2 cm. The postoperative plaster splint was removed after 6 to 8 weeks. In the cases where the deformity caused limitation in pronation-supination only, a distal resection of the ulna was considered to be sufficient.

Median nerve compression symptoms were reported in 19 per cent of the patients. These symptoms disappeared in most of the patients

after the osteotomy, but occasionally a discission of the volar carpal ligament was needed. One patient developed a full-blown picture of a shoulder-hand-finger syndrome postoperatively. In the other patients the result was beneficial.

Osteotomy of the radius seems to be an advisable adjunct to the resection of the ulnar head in cases where the angular deformity of the radius is so severe that it significantly impairs radiocarpal movement.

IMAGE STORE FLUOROSCOPY IN SURGERY OF THE FRACTURED HIP

Kari Pietilä & Pär Slätis
Division of Orthopaedic Surgery and Traumatology, Surgical Clinics, Helsinki

The recent development of radiographic image store devices permits the collection of consecutive radiographic images obtained during operative procedures. With image stores the automatic exposure time required for each picture is short, and therefore the irradiation is correspondingly reduced—and is considerably shorter than that with conventional pedal-controlled continuous fluoroscopy.

The value of image store fluoroscopy in surgery of the hip was assessed in 54 patients whose fractures of the femoral neck or trochanteric region were treated with fixed angle AO/ASIF nails. In 34 patients, reduction of the fracture and positioning of the nail were checked with conventional fluoroscopy. In 20 patients this evaluation was performed with a 100-picture store (VAS-IS 100) attached to the X-ray device. The mean time of irradiation in the first group was 385 ± 168 seconds (S.D.), and in the second group 86 ± 48 seconds (S.D.). Thus, image store fluoroscopy appreciably reduced the period of irradiation during the operation and, additionally, facilitated the accurate radiographic evaluation of each step in the operation.

POST-TRAUMATIC SUBLUXATION OF THE PATELLA

A. Alho
Section of Orthopaedics and Traumatology, University of Bergen Hospital, Norway

Twelve patients were treated operatively for a subluxation of the patella. The cause was traumatic in all cases. The primary treatment had been conservative or none at all. Both sexes were equally represented; the age range was 18–44 years. The symptoms and signs were: pain on weight-bearing (all), giving away (10), momentary lockings (4), pain on resisted extension (5), and lateral instability of the patella (9). A tendency for subluxation was demonstrated in six cases by using Merchant X-ray projection (*J. Bone Jt Surg.* 1974, **56**-A, 1391). No preexisting deformities of the knee were observed. A release incision of the lateral retinaculum was used in three cases, Campbell technique with release in six cases, Roux-Goldthwait operation in one case, and a combination of all these in two cases. Plaster immobilization was used for 2 to 6 weeks. Only detached fragments of chondromalacia, present in seven cases, were removed. Seven patients were totally symptomfree and five had some pain on weight-bearing after a follow-up period of ½ to 3 years. It was concluded that post-traumatic subluxation of the patella is a distinct entity to be kept in mind in the flexion-abduction-external rotation injuries.

OSTEOTAXIS IN TREATMENT OF COMPLICATED FRACTURES OF THE LOWER EXTREMITY

S. Santavirta & E. Karaharju
Division of Orthopaedic Surgery and Traumatology, Surgical Clinics, Helsinki

Hoffman's osteotaxis is a therapeutic alternative in the treatment of severe primarily complicated fractures and infected pseudarthroses of the lower leg and femur. From 1973 to 1976, 11 cases of this type were treated. In seven of these cases the fracture was located in the tibia. In three cases osteotaxis was the primary treatment and in the remainder osteotaxis was chosen after primary treatment had failed. In six patients primary treatment with osteosynthesis had resulted in an infection and osteotaxis was chosen for further treatment. In the first stage the material of osteosynthesis was removed and a lavation was performed. In the second stage, when the infection had ceased, bone transplantation was performed while the external fixation stabilized the fracture area. The average time of frame immobilization was 150 days. One case resulted in amputation below the knee. Three fractures failed to consolidate despite cancellous bone transplantation. In seven fractures the osteotaxis resulted in consolidation. In three of these cases bone transplantation had been necessary. Osteotaxis can be recommended for the treatment of severe fractures, with amputation often being the only alternative.