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The Orthopedic Hospital of the Invalid Foundation
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Experimental orthopedics

Experimental scoliosis in rabbits by extension splint

Mikko Poussa, Dietrich Schlenzka and Veijo Ritsilä

The Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland

Experimental scoliosis in growing animals has been produced by several methods, many of which are operative. This study was made simply by applying an extension splint to 6-week-old rabbits.

Radiographs were obtained before the application of the splint and 2, 4, 5, 6, 7, 8, 9, 12, and 24 weeks afterwards. The splint was removed after 8 weeks.

Thirty rabbits were used for the experiment, of which 2 died of lower extremity paresis and 3 of lung congestion. Among the 25 surviving rabbits, scoliosis developed in 21 rabbits. Those which did not develop scoliosis seemed to retain the thoracic kyphosis.

We conclude that experimental lordosis in the thoracic spine produced the scoliotic curves.

Effect of the amputation on the growth of the stump in young rabbits

T. Viljakka and V. Ritsilä

The Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland

Amputation of the tibia in young rabbits stimulated significantly epiphyseal growth in the tibia. The change was most marked 4 weeks after operation. Appositional bone formation was observed 2-4 weeks after the amputation. Thereafter, resorption occurred in the stump. The total length of the tibial amputation stump increased during the period from 2-12 weeks after amputation, and the same was true for the length of the femur of the amputated limb, though to a lesser extent. A fibular graft at the apex of the amputated limb was resorbed, and growth stimulation or increase in length of this bone did not occur. In general, the amputation did not influ-

ence the time of closure of the epiphyseal plate. By some yet unknown mechanism, stump growth was stimulated by amputation.

Histomorphometric analysis of the changes of articular cartilage and subchondral bone after intraarticular osteotomies of the distal femur in rabbits

Immo Vihtonen, Seppo Vainionpää, Matti Mero, Hannu Pätiälä and Pentti Rokkanen

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

The medial and lateral condyles of the right femur in 117 adult rabbits were investigated after osteotomies of the distal femur and of the medial condyle fixed with two different methods. The left femur served as a control. Follow-up times were 1, 3, 6, 12, and 48 weeks. The distal part of each femur was removed, fixed in alcohol, embedded in methylmethacrylate, and sectioned 5- μ thick. Quantitative histomorphometric analysis of the articular cartilage and subchondral bone adjacent to it was performed using a semiautomatic computer linked via a television camera to a light microscope. The numerical measurements were analyzed with the Student's *t*-test. The influence of the operation in general, of the quality of osteotomy, of the fixation method, of the success of bone healing, and of the time of examination were evaluated. The comparison of the results of the operated on knees to those of the controls showed significant increase ($P < 0.001$) in the area of the articular cartilage of the medial condyle and less increase ($P < 0.2$) of the lateral condyle. At the same time, the number and area of living chondrocytes remained unchanged. In adjacent subchondral bone, a significant decrease ($P < 0.002$) of the volume of matrix was observed in the medial condyle. In the lateral condyle the decrease was less prominent ($P < 0.01$). It is obvious that the diminished use of the operated on limb is the reason for the change noticed in the articular cartilage and subchondral bone. This hypothesis was supported by the finding that if the healing of the osteotomies was disturbed the increase of the area of the cartilage was larger than after normal bone healing.

Shoulder

Coracoid tendon transposition a.m. Bristow-Latarjet

Pekka Jalovaara, Timo Niinimäki, Juhani Rämö and Ralf V. Lindholm

University of Oulu, Subdivision of Orthopedics, Oulu, Finland

The technique of proximal coracoidal conjoined tendon transposition originally invented in 1939 has gained much popularity in recent years as a convenient operation for recurrent anterior shoulder dislocation. The procedure includes separation of the short head of the biceps and coracobrachialis from the coracoid process with a 1–2-cm piece of bone. The tip of the coracoid, with the attached conjoined tendon, is transposed and fixated with a screw proximal to the glenoid margin. Twenty-three operations have been performed in our unit since 1984. The series consisted of 12 recurrent dislocations, 5 chronic subluxations, 3 with occasional dislocations, and 3 anterior + inferior (multidirectional) subluxations. The patients were followed-up at 15–36 months. Improvement was obtained in all the cases except 4, of which 1 evidently was due to improper location of the transplant, and the 3 remaining ones had a positive traction test for instability in the inferior direction besides anterior chronic subluxation. Fourteen results were rated excellent.

The usefulness of the Bristow-Latarjet operation is largely confirmed by our series. Correct location of the coracoidal attachment according to recommendations and preoperative exclusion of multidirectional instability will improve the results. Fibrous union and some migration of the screw between the coracoidal transplant and the recipient site was noted in some instances, but did not interfere with the outcome.

Migration of Kirschner pins used for stabilization of the clavicle: A report of 2 cases

Pekka Jalovaara, Valter Myllylä and Ralf V. Lindholm

University of Oulu, Subdivision of Orthopedics, Oulu, Finland

The dangerous situation where a sharp-pointed pin within the clavicular bone migrates and may cause even life-threatening complications is not always remembered.

This is a report of 2 cases illustrating migration soon after fixation.

A 56-year-old male had a lateral comminuted fracture of the clavicle treated with wire sutures and a Kirschner pin across the acromion and the fracture site. The lateral end of the pin was left protruding into the subcutis for easy removal. On the 24th postoperative day, radiographs revealed migration of the pin into the clavicle and 2 days later even 1 cm more. After 5 days, the pin had migrated medially out of the

bone in the space between the trachea and the cervical spine and was then operatively removed.

The second case, a 48-year-old male patient, had an operation for a persistent sternoclavicular luxation. The medial end of the clavicle was fixed to the sternum with a tendon stitch graft and secured by two Kirschner pins driven through the sternum across the joint into the clavicle. The pins were cut close to the bone covered by the skin. Twenty-five days later, one of the pins was seen to have migrated into the mediastinum with its sharp end resting on the aortic arch. It was removed by mediastinotomy. The other pin migrated subcutaneously to the mammary region.

Many reports described serious complications, even fatal outcomes, caused by injury to vital organs by migrated pins used for stabilization of the acromio-clavicular-sternal skeleton. We found the impending danger in time. This problem can be prevented by using devices designed to restrain sliding, e.g., threaded pins or pins with an outer curved end. In the case of migration, removal of the pin is immediately indicated.

Unstable four-part fracture of the proximal humerus with posterior dislocation of the shoulder

Pekka Jalovaara, Pekka Kortelainen, Markku Päivänsalo and Ralf V. Lindholm

University of Oulu, Departments of Surgery and Radiology, Oulu, Finland

Recently, we experienced three unstable four-part fracture-dislocations (type Neer VI). They all were operated on by open reduction and fixation.

Case 1. The injury was caused by an epileptic convulsion attack in a 34-year-old male. After two unsuccessful attempts at closed reduction, an operation was performed on the third day. The articular surface fragment had only residual capsular attachments left. The lesser tuberosity was fixed with a screw, whereas the others were held by metallic wire sutures. Primary stability seemed very satisfactory. The wound, however, became infected and showed fistulous discharge. The implants had to be removed 5 months after the operation. At that time, signs of avascular necrosis were also present. At follow-up 1 year after injury, the humeral head had been almost totally resorbed. Function of the shoulder remained poor, and active abduction was possible only in the supine position.

Case 2. This injury was caused by epilepsy in a 33-year-old male. Radiographs revealed a four-part fracture-dislocation. Two days later, open reduction and fixation using wires were carried out according to the technique described above. The fracture healed in a satisfactory position, but the head of the humerus was shown to be slightly deformed at follow-up 9 months later. Bone scanning exhibited some irregularity of uptake. Shoulder movements were markedly restricted: abduction and flexion to the horizontal position, external rotation 20°, and internal rotation 70°.

Case 3. A 67-year-old female fell on her left shoulder and sustained an unstable four-part fracture-dislocation of the humerus. An operation was performed 12 days later with good reconstitution of the anatomy. The fragments were fixed with biodegradable synthetic sutures through bore holes. At follow-up 2 months later, the fragments had retained their good position and no radiographic evidence of avascular necrosis was presented.

This type of fracture-dislocation is a complex injury. The four main fragments consist of the articular surface of the humeral head, the greater tuberosity, the lesser tuberosity, and the surgical neck of the humerus. To assess the anatomy, it is necessary to have at least two-plane radiographic images. It is most unlikely that any attempt at closed reduction will succeed. Undue postponement of an operation is likely to make the procedure increasingly difficult and the outcome correspondingly poor. The objective of the operation is to reattach the more important muscles, to reduce each fragment and secure it in place by internal fixation. Because most poor results are known to be caused by avascular necrosis of the humeral head, it is sensible to take particular care of any remaining blood-supplying tissue. According to our experience, traumatization can be minimized using wire sutures instead of more solid osteosynthesis material. Even thick absorbable material has strength enough to keep the fragments at rest. In Case 1, deep infection may have been a contributing factor to avascular necrosis. In Case 3 the follow-up is not long enough to exclude avascular necrosis. It has been stated that a totally denuded joint surface fragment had better be replaced by an endoprosthesis of some type. Preparedness for that procedure is, however, not very common yet.

Varia

Dupuytren's contracture — the results of surgical treatment

E. Antero Mäkelä, Heikki Jaroma, Arvi Harju, Seppo Anttila and Jyrki Vainio

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

The cause of Dupuytren's contracture is unknown, but a definite correlation with the male sex, alcoholism, epilepsy, and

heredity have been suggested by several authors. The main operations are fasciotomy, limited fasciectomy, and radical fasciectomy.

A total of 199 operations in 157 consecutive patients were performed from 1976 through 1984. In all, 158 operations were carried out as outpatient procedures. The mean follow-up time was 3.2 years. Twenty-seven percent of the patients had a positive familial history of the disease, and 8 percent had diabetes. The mean age was 63 (30-77) years, and females constituted only 8 percent of these patients.

Subtotal fasciectomy resulted in good immediate and long-term improvement in 87 percent of the patients. A recurrence rate of 27 percent was found. Progression of the disease in areas not previously operated on was seen in 7 percent of the patients. The most common permanent complication was the damage of a digital nerve, although only two digital nerve divisions occurred during operation.

In conclusion, Dupuytren's contracture is a progressive disease with a high rate of disease recurrence most of which are apparent within 2 years after operation.

Revision of total hip replacement for aseptic loosening: Radiographic results

Jaakko Joukainen, Antero Mäkelä and Arvi Harju

Department of Orthopedics, Kuopio University Central Hospital, Kuopio, Finland

Aseptic loosening of total hip arthroplasty may result from biomechanical failure or formation of foreign body granulomas. Although the majority of patients that have undergone a revision arthroplasty do well, the high incidence of radiographic loosening is of serious concern.

Between 1972 and 1987, a total of 830 total hip arthroplasties were performed. Since 1975, 35 of them have been revised for aseptic loosening. The mean interval between the initial operation and revision was 6 years, and the follow-up after revision operation was 21 months. The radiographic assessment was accomplished by using the Mayo hip score.

The mean radiographic score was 8.2 points before and 15.5 points after revision. The revisional arthroplasties in these 35 patients accounted for 4.2 percent of the primary arthroplasties. Twenty-six hips received more than 14 points. Taking into account the short follow-up time, the cemented revision arthroplasty gave satisfactory results.