

INTERNATIONAL FEDERATION of SOCIETIES for SURGERY of the HAND

Committee on Rheumatoid Arthritis

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WRIST ARTHRODESIS versus IMPLANT ARTHROPLASTY

Introduction.

The wrist consists of more than 13 joints which, from the functional point of view, can be grouped into three main joints: radio-carpal, midcarpal and distal radio-ulnar. The distal radio-ulnar joint is mainly designed to provide rotation of the distal radius around the ulnar head, allowing for pronation and supination of the forearm. Extension, flexion, radial and ulnar inclinations of the wrist take place at the radio-carpal and midcarpal joints.

When both radio-carpal and midcarpal joints are destroyed by the arthritic process, only two surgical alternatives can be considered: arthrodesis or arthroplasty. Correction of the deformity and pain relief can be obtained by either procedure. Many surgeons recommend a wrist arthrodesis because it is reliable and technically relatively easy. Conversely, arthroplasty has historically been fraught with complications, primarily loosening. For this reason, wrist arthroplasty is not recommended for patients with high mechanical demands on their wrists, such as those who use crutches or walkers or who would like to perform sports activities. Although patients who undergo an arthrodesis, may adjust to the loss of wrist mobility, they prefer a functional arthroplasty over a wrist fusion.

Indications for wrist arthrodesis and wrist arthroplasties.

The surgeon should let the patient decide which procedure he prefers to have done, after being fully and clearly informed of the advantages and disadvantages of each. Given the choice, most patients with rheumatoid arthritis would prefer to maintain or improve wrist mobility to compensate for the loss of function in the rest of the joints of the upper extremity. However, it is also the responsibility of the surgeon not to recommend an arthroplasty in certain patients.

There are no formal contraindications for an arthrodesis. On the other hand, before recommending an arthroplasty, the patient's general condition and the characteristics of the wrist pathology should be carefully evaluated. An arthroplasty has more risk of mechanical failure in young patients, as well as in those who only have the wrist joint involved, or who need walking aids due to problems in their lower extremities. Rupture of wrist extensor tendons is also considered a contraindication for an arthroplasty, although it can be performed in certain cases, when the rupture occurred recently. The ruptured tendons can be repaired at the same time the arthroplasty is done, and should be immobilized postoperatively for a few weeks to allow healing of the repair. Simultaneous tendon repair should not be considered in those cases in which the implant requires immediate postoperative mobilization, as wrist flexion may be limited after a prolonged immobilization in extension. In most cases it is difficult to know for how long the wrist extensor tendons have been ruptured, as frequently they suffer partial rupture and progressive elongation bridged by scar tissue. The degree of joint deformity and loss of passive wrist extension are other factors responsible for

making the diagnosis of tendon rupture even more difficult. Long standing wrist extensor tendon ruptures are more difficult to treat, as not only the tendon gap is wider, but the muscle fibres undergo atrophy and retraction of its sarcomere, losing its capability to elongate and contract.

Further considerations when considering an arthroplasty are the status of the skin in the dorsum of the hand and wrist, and the degree of destruction and instability of the carpal bones. If the skin in the dorsum of the wrist is extremely thin, scarred or adherent to deep structures, the risk of becoming necrotic or infected is much higher, seriously jeopardizing the functional outcome of an arthroplasty. Probably, the most important contraindication for a wrist arthroplasty is the destruction of the distal carpal row. In patients with a disintegrating type of disease, where the carpal bones and the intercarpal and carpo-metacarpal ligaments are destroyed, the risk of loosening of the distal implant component is high. The proximal component of the wrist implant is placed in the medullary cavity of the distal radius, well supported by cortical bone. However, the distal component, although it may have some metacarpal anchoring, is mainly supported by the distal carpal row, which consists of cancellous bone, as well as intercarpal and carpo-metacarpal joints with more or less ongoing synovitis. This is a contributing factor to subsidence and loosening of the distal component.

When an implant arthroplasty is performed in cases where the distal carpal row is relatively well preserved, an intercarpal synovectomy and bone fusion it is recommended, with the addition of an abundant intercarpal bone graft, so as to obtain a solid fixation of the distal component.

Position of wrist arthrodesis

The recommended position of wrist arthrodesis is 5-10 degrees of wrist extension and 0-5° of ulnar inclination. In cases of bilateral wrist fusion, the opposite wrist should be arthrodesis in moderate flexion to facilitate perineal cleaning.

Methods of internal fixation for the arthrodesis

In younger patients, with good cortical bone and when the wrist fusion is being done as a single procedure, dorsal plate and screw fixation is the best choice, using a low profile and slightly curved plate.

When the bone stock is not adequate for screw fixation or to minimize surgical time when multiple procedures are done in one stage, endomedullary fixation with Steinman rods is recommended. Proximal fixation is obtained with two intramedullary rods in the radius, and distal fixation with the rods inside the index and middle finger metacarpals. In patients who have already had an implant arthroplasty of the MP joints, this technique may not be feasible. In these cases the distal rods will have to be placed through the carpal bones and in between the index and middle finger, and the middle finger and ring finger metacarpals.

Types of wrist implant

Silicone implants should be considered as spacers and provide good functional results as far as pain relief, correction of the deformity and maintaining or restoring joint mobility. However, flexible silicone implants do not withstand the forces transmitted across the wrist joint. With the passing of time, they subside into the distal carpal row, may rupture and cause cystic bone destruction due to foreign body granulomas to the silicone particles abraded from its surface.

Total wrist joint implants are made of polyethylene and metal components, and are fixed in bone by porous stem fixation, in growth, or screw fixation with or without using with bone cement. There is a trend currently to move to cementless fixation of proximal components and screw fixation of distal components in fused carpal bones. Controversy exists in the material of the articulating components (plastic on concave or convex side) and in location of surfaces (cup distal or proximal), but all models except one (Meuli prosthesis) have developed from a ball and socket design to an ellipsoidal interface which simulates more normal wrist motions.