Universal 2 total wrist arthroplasty

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Abstract The Universal 2 wrist replacement is considered by many to be the implant of choice in patients with inflammatory arthropathy requiring joint replacement. The procedure is discussed in this article and technical aspects considered.

Keywords Wrist · arthroplasty · rheumatoid · wrist replacement.

Introduction

It is thought that Gluck, in the 1890s, first performed a total wrist arthroplasty [1]. However, it was not until Swanson developed the Silastic prosthesis that the procedure became viable. Numerous implants have since been made available.

Currently, one of the most commonly used implants is the Universal 2 (KMI medical inc) which comprises a cobalt-chrome press-fit radial component with a partially porous-coated stem, a porous-coated titanium carpal component (fixed with a central peg and two screws) and a convex ultra high molecular weight (UHMW) polyethylene insert (figure 1). This obviates the need for cement. The Universal Wrist Replacement was designed by Menon[2] and then modified into the Universal 2 by Adams [3].

It is recommended for use primarily in patients with rheumatoid disease in whom pain and loss of function are the predominant complaints. Good bone-stock is essential. It is contra-indicated in those with severe deformity, tendon rupture, active inflammatory disease and infection.

Technique

The operation is usually performed under general anaesthetic, with a tourniquet, in a laminar-flow operating

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Fig. 1 The universal 2 wrist replacement

theatre. Prophylactic intravenous antibiotics (Cefuroxime 1.5 g) are given with induction and before inflation of the tourniquet. The procedure can take two hours or more and it is worth bearing this in mind if a regional block is used. The tourniquet should be deflated after two hours in order to prevent neurological and muscle damage.

It is important to select the correct size of implant; templates are available for this. When in doubt it is best to insert a slightly smaller rather than a slightly larger implant.

A dorsal midline incision is made with dissection of the superficial and deep fascia to reveal the extensor retinaculum which is elevated from the radial to the ulnar side, detaching each individual extensor compartment (figure 2a). The ulnar head is then excised if required; this is usually the case but not mandatory-the implant is designed to be inserted regardless of this. The capsule of the wrist joint is then reflected as a distally-based flap (figure 2b).

Under image-intensifier guidance, a guide-rod is inserted so as to lie in the midline on both AP and lateral views. A jig is inserted over this which allows determination of the extent of bone to be resected from the distal radius. Using a cutting block, bone is resected to subchondral level (figure 2c). The radius is then prepared with a rasp and a trial radial component inserted (figure 2d and 2e).

Preparation of the carpus is a little more complex. First, the lunate has to be excised (figure 2f). It is also

usually necessary temporarily to transfix the triquetrum and the scaphoid to the other carpal bones with k-wires. Using the guide centred over the third metacarpal, a drill-hole is made in the capitate and the cutting block inserted (figure 3a). This allows the surgeon to excise, with some accuracy, about half of the triquetrum and scaphoid. The trial base plate can then be inserted and the metacarpal guide placed so as to allow drilling of holes for the two screws (figure 3b); one into the second metacarpal and the other into the hamate in line with (but not into) the fourth metacarpal since it is important that the mobility of this carpo-metacarpal joint is maintained. This is checked with the image-intensifier. The central peg is inserted into the capitate. Trial screws are used to fix the component.

A trial reduction is performed following insertion of the radial component and the polyethylene insert. Ideally, about forty degrees of dorsiflexion and palmar flexion is obtained with about five to ten degrees of radio-ulnar deviation. Distraction of the carpus should open up a gap of no more than five millimeters. Occasionally, further soft-tissue balancing is required and it may be necessary to release the volar capsule (care being taken not to damage the median nerve) or z-lengthen the wrist flexors and/or extensors.

Fig. 2a–f Approach, bone resection, proximal preparation, insertion of radial component and lunate excision

Fig. 3a–d Distal cuts, insertion of carpal component, closure and final X-ray

The definitive components are inserted and the capsule closed by suturing the flap to the distal radius through drill-holes using a non-absorbable suture (figure 3c). The retinaculum is repaired and the skin closed. A volar splint is applied in order to prevent flexion deformity post-operatively. Check X-Rays are taken (figure 3d).

Following this procedure, swelling is considerable. It is important, therefore, that the arm is elevated. If necessary, the splint can be removed after 48 h, a non-absorbent dressing applied and ice-packs used. The wrist may be mobilized straight away or splinted for two weeks and mobilization commenced when the swelling has diminished. It is important that the patient is kept in hospital until the swelling has improved to the extent that full

finger flexion is possible and pronosupination is adequate.

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