Elbow arthroplasty is performed less often than hip or knee arthroplasty. The most common reason for patients requiring elbow arthroplasty is chronic inflammatory joint disease, usually rheumatoid arthritis.\(^1\)

Two main types of prostheses exist, linked and non-linked. Prosthesis fixation in bone is achieved with bone cement in almost all linked and non-linked prostheses.\(^2\) Cement restrictors prevent migration of cement and ensure a good cement-bone interface by increasing the cement penetration in bone.

The commercially available polyethylene and silicone restrictors are too big for the ulna, migrate, and poorly contain cement, even when used in the distal humerus.\(^3\)

This article presents a technique that uses bone chips to fashion an effective cement restrictor for elbow arthroplasty.

**SURGICAL TECHNIQUE**

Three patients aged 63, 67, and 74 years, respectively, underwent elbow arthroplasty for rheumatoid arthritis. A cement restrictor was fashioned from bone chips harvested from the humeral condyles. All three patients received a Souter-Strathclyde prosthesis (Howmedica, London, UK).

The elbow was approached through a straight posterior midline skin incision. Ulnar nerve decompression was achieved by releasing the fibrous arch proximal to the entry of the ulnar nerve at the cubital tunnel into the flexor carpi ulnaris. A triangular shaped flap with a distal base was raised in the triceps tendon.

The radial head was excised in all three cases as was the radial collateral ligament and capsule and ulnar collateral ligament to gain satisfactory access into the interior of the joint. The distal humeral condyles were cut using jigs, and the excised bone was saved for use as a cement restrictor.

The proximal ulna was prepared to accept the ulnar component. The excised bone was morsellized using bone nibblers and bone cutters. Small amounts of morsellized bone were then inserted into the medullary canal of the ulna and tapped in using the trial ulnar prosthesis until the graft was just beyond the tip of the prosthesis. This process was repeated until a tight fit was achieved at the tip of the prosthesis. Because the medullary canal of the humerus is larger than the ulna, the bone plug needs to be large enough to occlude the canal just beyond the tip of the prosthesis. In addition, morsellized bone was also packed to achieve a wall of resistance.

The humerus and ulna canals were lavaged with normal saline, and the humeral and ulnar components were cemented using low viscosity cement, which was pressurized. The incised ends of the triceps tendon and dorsal fas-
cial layer on the radial side of the olecranon were sutured. The incised ligaments on the medial side were resutured using a bone suture. Radiographs showed good containment of the cement in the humerus and ulna (Figure).

DISCUSSION

Elbow arthroplasty, although less common than shoulder, finger, hip, and knee arthroplasty, is becoming a routine operation in specialized centers. A variety of unlinked prostheses such as the Kudo (Biomet Merck, Toermaljuring, Netherlands), Norway, and Souter-Strathclyde, and linked prostheses, such as the Coonrad-Morrey (Zimmer, Warsaw, Ind), have been used for total elbow arthroplasty. New jigs have also been designed to help place these prostheses in correspondence to the normal center of rotation of the elbow. An ideal cement restrictor for use in elbow arthroplasty, however, has yet to be found.

The commercially available polyethylene and silicone restrictors are often too big for the ulna and are prone to migration even when used in the humerus. Containment of cement is important on two accounts. First, it improves the bone-cement interface. Second, during revision, a lesser risk of shaft perforations while extracting cement exists when it does not extend a great distance beyond the tip of the prosthesis being revised.

Bone chips have the advantage of being small enough to pack the medullary canal of the ulna. By sequentially packing small amounts of bone using a trial stem, it is possible to ensure a snug fit at the tip of the prosthesis as well as ensuring that the bone plug is just beyond the tip of the prosthesis. The size of the bone used to occlude the humeral medullary canal needs to be larger than that used for the ulna to provide a snug fit and wall of resistance for cement restriction.

We found that the trial ulna components of the Souter-Strathclyde prosthesis could be used to estimate the size of the intramedullary diameter of the humerus. The bone plug for the humerus could then be fashioned to the size of the trial ulna component tip. The trial humeral component was used to insert the bone plug into the medullary canal. The bone plug was supplemented with morsellized bone until a snug fit was achieved. The use of the trial humeral component to insert the bone plug ensured that the bone plug was beyond the tip of the humeral prosthesis. Accidental bony occlusion at an unintended site in the medullary canal can be easily dealt with by drilling through the bone plug.

REFERENCES