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ORIGINAL STUDY

Trapeziometacarpal joint replacement with the Arpe prosthesis

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The purpose of the study was to assess the subjective outcome and five-year survival of non-cemented total joint replacement of the trapeziometacarpal joint with the Arpe prothesis. Forty-nine hands were operated on. Outcome scores were obtained with a mean follow-up of 6 years (range : 3-11 years) for 35 prostheses. Mean disability of the arm, shoulder and hand (DASH) score was 8, mean visual analogue scale for pain 1, for satisfaction 9.6 and for willingness to have the same operation again 9.8. Six patients were lost to follow-up. Two prostheses (5%) dislocated and four implants were removed. At five years the prosthesis was still in place in 33 out of 34 hands. The overall mid-term results of the Arpe prosthesis were satisfactory. Five-year survival was 97%.

Keywords : trapeziometacarpal joint ; osteoarthritis ; total joint replacement ; Arpe prosthesis.

INTRODUCTION

Osteoarthritis of the trapeziometacarpal joint is common in elderly patients and is more severe in women than in men (*18*). The standard surgical procedure for painful and disabling arthritis is simple trapeziectomy (*25*), even tough a small percentage of patients may have pain related to proximal migration of the base of the first metacarpal (*6*). Numerous surgical procedures for trapeziometacarpal osteoarthritis have been reported. This may indicate that a surgical technique with predictable good and lasting results has not been found yet, especially in relatively young patients with high functional demands. The first prostheses for the basal joint of the thumb were silicone implants (*19*). Currently they are not recommended anymore because of possible complications such as "siliconitis" and breakage (*2,23*). The first ball-and-socket prosthesis was proposed by de la Caffinière (*7*). However, at long-term loosening has been reported and nowadays this implant and other similar designs of cemented prostheses are only recommended in older patients with low activity demands (*2,8,24*). The Ledoux prosthesis, a non-cemented total joint replacement was introduced in 1990, but results were not uniformly good and it was withdrawn from the marketplace (*14,24*). Currently, newer models of non-cemented semi- or unconstrained total joint replacements are available. Examples of these prostheses are the Arpe (*11*), Elektra (*17*), Maia (*20*), Roseland (*16*) and Ivory prosthesis. Long-term follow-up of these implants still has to be established.

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There are scarce reports on survival of the Arpe prosthesis. In the study of Apard and Saint-Cast, 85% of prostheses were still in place after five years (*1*). The purpose of the current study was to assess subjective outcomes of the Arpe prosthesis with a follow-up of at least 3 years and to investigate the 5-year survival.

PATIENTS AND METHODS

Between April 2001 and May 2008, 49 hands in 41 patients were operated on with a non-cemented total joint prosthesis (Arpe, Biomed). Mean age was 55 years (range : 37-79). Forty prostheses were implanted in female and 9 in male hands. Twenty-eight hands were operated on the left side and 21 on the right.

Patients were assessed by the first author independent of the operators. A questionnaire was sent to the patients with the disability of arm, shoulder and hand (DASH) score (*15*) and visual analogue scale (VAS) for pain, satisfaction and willingness to have the same operation again (*10*). VAS scores range between 0 and 10. For pain a score of 0 indicates no pain and 10 the strongest pain imaginable. A VAS score for satisfaction of 0 means extremely dissatisfied and 10 extremely satisfied. A VAS score for willingness to have the same operation again of 0 indicates that the patient absolutely would not undergo the same operation again and a score of 10 that the patient would be strongly willing to undergo the same procedure again. The medical files were studied to find information on additional surgical procedures on the thumb. Patients who did not reply to the questionnaire were contacted by telephone.

The questionnaires were sent to and answers were expected from 37 patients with 43 prostheses out of 41 patients with 49 prostheses. Two patients did not respond. Six prostheses were not included in this follow-up study : in four patients the prosthesis had already been removed at the time of follow-up. Two other patients underwent additional surgical procedures on the thumb since the prosthesis had been inserted (in one patient reconstruction of the medial collateral ligament of the metacarpophalangeal joint of the thumb was done with persistent instability and another patient needed arthrolysis to improve the range of motion of a prosthesis inserted on a fused scapho-trapezio-trapezoidal (STT) joint. In 2 patients with bilateral arthroplasties, the prosthesis had been removed in one hand. In the other hand it was still in place and could be evaluated with DASH and VAS scores.

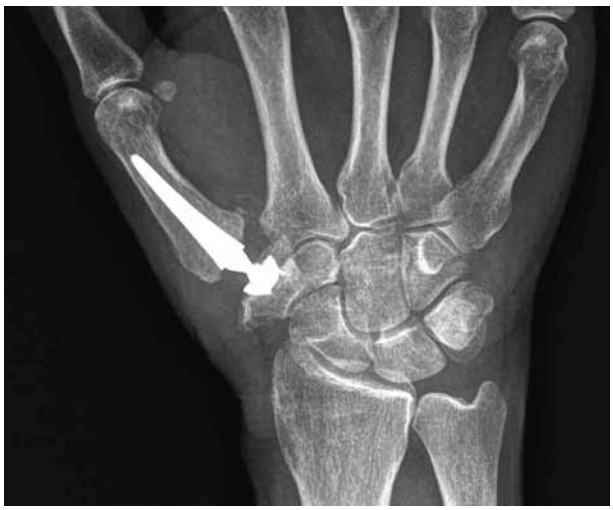

Fig. 1. — Radiograph of an Arpe prosthesis, 5 years postoperatively in a 66-year-old woman.

Trapeziometacarpal joint replacement was done in hands stage 2 or 3 of the Eaton classification (*9*), except in one patient who already had a fusion of the STT joint.

The implant

The Arpe prosthesis looks like a small total hip prosthesis with a hydroxyapatite-coated stem and cup (Fig. 1). The stem comes in four different sizes. The cup has two sizes and the polyethylene can be retentive or non-retentive. The metal neck and head are made out of one piece and can be straight or with offset. Two different lengths were available at the time patients were operated on : medium and long (*12*).

Surgical technique

Patients were operated on under general anaesthesia, with an upper arm tourniquet. A dorsal approach to the trapeziometacarpal joint was used. With an oscillating saw, bone was removed from the base of the first metacarpal and trapezium at the level of the subchondral bone, and osteophytes were excised. The medullary canal of the first metacarpal was rasped and a trial stem was inserted. A pin was placed in the test stem to locate the most stable center for the cup in the trapezium. Initially, a drill bit with a round cutter was used to make a small hole in the trapezium. This was subsequently enlarged by hand with the hemispherical reamer. The cup was inserted and a trial reduction was done. All cups had

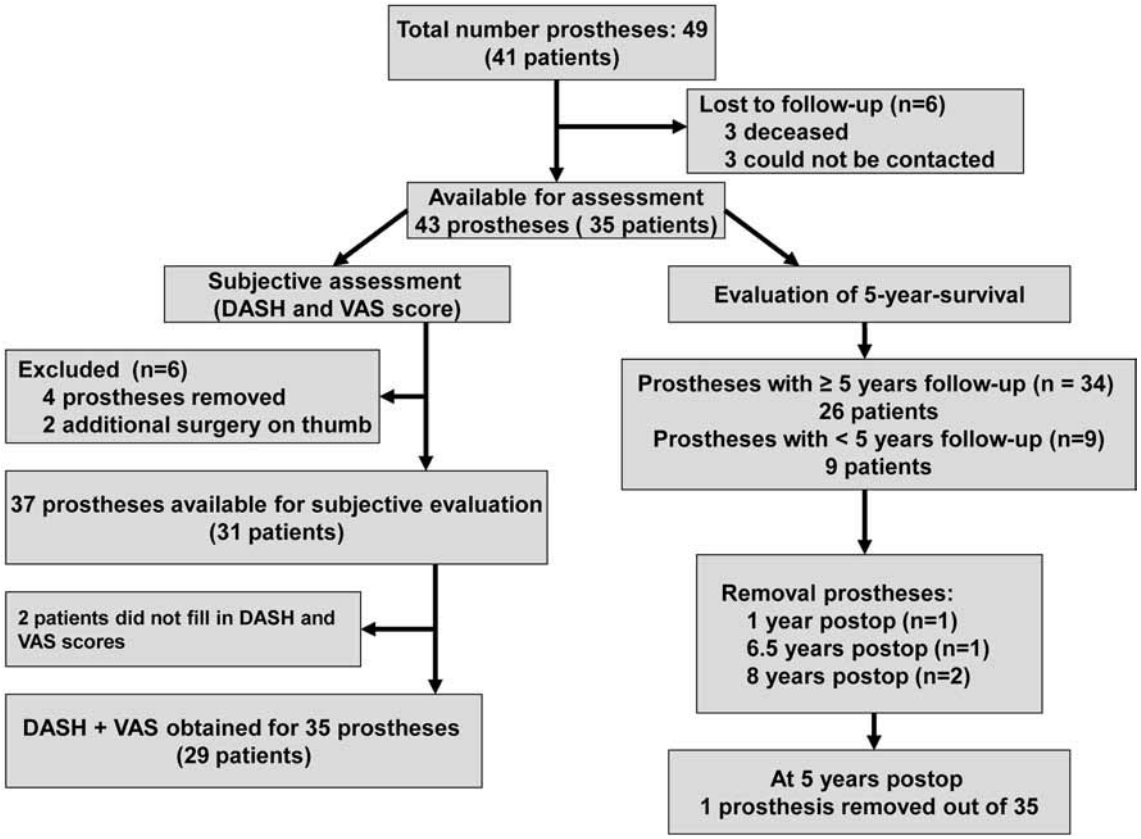

Fig. 2. — Schematic presentation of subjective assessment and evaluation of 5-year-survival of prostheses

a diameter of 9 millimeters and were non-retentive. After insertion of the definitive stem and neck the subcutaneous soft tissues and skin were closed and a forearm plaster cast including the thumb was applied. After one or two weeks, skin sutures were removed and a splint allowing movement of the wrist and long fingers was applied for another 3 to 4 weeks. If the prosthesis was stable a removable splint was applied. Five patients also had a release of the carpal tunnel.

RESULTS

Of 37 patients (43 prostheses), 6 were lost to follow-up (Fig. 2). Three had died and 3 could not be contacted. No DASH or VAS scores could be obtained in 2 other patients, but information about additional surgical procedures was available in the medical files with a follow-up of 5 and 10 years respectively.

Of 35 prostheses DASH and VAS scores could be assessed with a mean follow-up of 6 years (range : 3-11 years). Eight patients were contacted by telephone. Mean age of the patients at surgery was 55 years (range : 38-68). Four prostheses were inserted in male and 31 in female patients. Mean DASH score was 8 (range : 0-54). The DASH was higher than 14 in only three patients. Mean VAS for pain was 1 (range : 0-8). Twenty-two patients (63%) were completely pain free. Eighty-seven percent had a VAS score for pain less than 3. Mean VAS for satisfaction was 9.6 (range : 5-10) and mean VAS on willingness to undergo the same operation again was 9.8 (range : 5-10). Only one patient was not prepared to have the same operation again.

In a woman initially operated on at the age of 47 years, the prosthesis was removed after one year

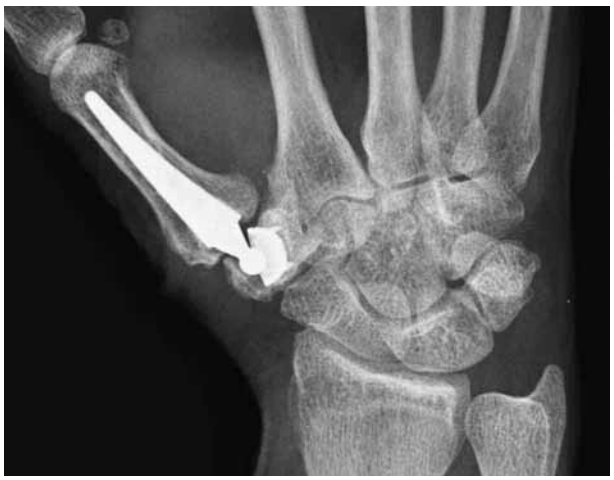

Fig. 3. — Cup loosening 6 years postoperatively in a 62-year-old woman.

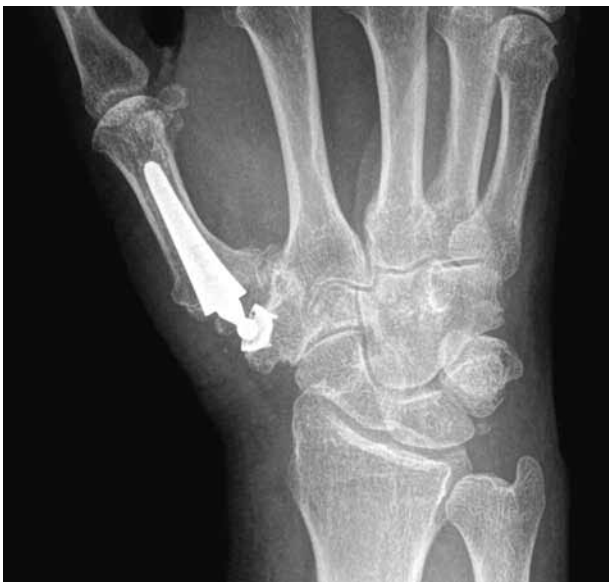

Fig. 4. — Eccentric position of the ball in the cup, indicating polyethylene wear 8 years postoperatively in a 70-year-old-woman.

because of persistent pain. The cup had perforated the medial cortex of the trapezium. In another woman who was 55 years old when the prosthesis was inserted, the implant was removed 6.5 years postoperatively because of cup loosening (Fig. 3). During insertion of the prosthesis there had been a fracture of the trapezium that healed with cast immobilization. In a man who was 45 years old at the time of the first operation, the prosthesis was removed 8 years postoperatively because of polyethylene wear. There was no loosening of the cup. In a woman initially operated on at the age of 61 years, the prosthesis dislocated 8 years postoperatively after a fall. The cup was not loose, but the polyethylene was worn (Fig. 4). In this patient another cup was inserted. In the former 3 patients, trapeziectomy with tendon interposition was done and the stem was left in place.

Dislocation of the prosthesis occurred twice in a woman in whom the prosthesis was inserted when she was 59 years old. The first dislocation occurred 9 months postoperatively and was treated with closed reduction and cast immobilization. Three months later the prosthesis dislocated again and the medium stem had to be replaced by a long stem. Five years postoperatively, the medial collateral ligament of the metacarpophalangeal joint of the thumb was reconstructed with a tendon graft because of non-traumatic instability. However, after some time the metacarpophalangeal joint became unstable again. In a woman initially operated on at the age of 61 years, the prosthesis dislocated 1 month postoperatively and open reduction was done. Seven months postoperatively another dislocation occurred and the medium straight stem was replaced with a stem with offset. Eight years postoperatively the prosthesis dislocated again after a fall. After open reduction the prosthesis was not stable because of polyethylene wear and the cup had to be replaced.

One patient had a complex regional pain syndrome. In the patient with the STT joint fusion the trapeziometacarpal joint was stiff and painful. She was reoperated on 5 years postoperatively. Bone was removed from the base of the first metacarpal to improve the range of motion. One patient was operated on for de Quervain's tendonitis 3 years postoperatively.

Information on additional surgical procedures was available for 43 prostheses (Fig. 2). Only one prosthesis out of 35 did not last for 5 years, so 5-year survival was 97%. In two patients the stem had to be revised because of instability, but this was not considered as removal of the prosthesis because cup and stem were still in place.

DISCUSSION

In the present study subjective outcome scores of the Arpe prosthesis were quite good. However, only patients who did not have additional surgical procedures on the thumb since the prosthesis was inserted, filled in the forms with DASH and VAS scores. Mean DASH score in the present study was 8, in another series of Arpe prostheses a mean score of 27 was reported (*1*) and the mean DASH score was 24 in a study with de la Caffinière implants (*8*). Sixty-three percent of patients in the present study were completely pain free. Complete pain relief was reportedly achieved in 96% of patients with the Braun Cutter prosthesis, a cemented constrained total joint replacement, but only low-demand patients over 60 years of age had been operated on (*2*).

Advantage of total joint replacement compared to trapeziectomy is fast recovery (*21*). Disadvantage is that the prostheses may not last long and patients may need additional operations to remove or revise the implants. Many studies have been conducted on the la Caffinière prosthesis. Wachtl *et al* reported that 66.4% of prostheses were still in place at 68 months (*24*). Five-year survival in the series of Boeckstyns *et al* was 80 % (*3*) and in the study of van Capelle *et al*, survival at 16 years was 72% (*22*). In low-demand patients over 60 years of age, 5-year survival with the Braun Cutter prosthesis was 96% (*2*). The Elektra prosthesis, a semimodular unconstrained hydroxyapatite-coated implant (*4*) had a revision rate of 44% at 72 months (*13*). In the series of Apard and Saint-Cast, five-year survival was 85% with the Arpe prosthesis (*1*). In the present study, five-year prosthesis survival was 97% ; however, it will decrease at longer follow-up, as 3 more prostheses have already been removed after five years.

A disadvantage of the Arpe prosthesis is that in case of problems with polyethylene wear, the cup has to be removed or revised even though there is no loosening ; this occurred in 2 patients in the present study. Dislocation can also be a problem. Nine percent dislocations were reported by Brutus and Kinnen (*5*) and Iselin (*11*), 8% by Jacoulet (*12*) and 6% by Apard and Saint-Cast (*1*). In the present study 2 patients had dislocations (5%).

This study has several weaknesses. It is retrospective, and preoperative DASH and VAS scores were not available. At follow-up radiographs were not studied to find out if radiological loosening was present and clinical examination was not performed. No subjective outcome scores were obtained for 14 prostheses (29%). Six prostheses were lost to follow-up (12%).

To conclude, good subjective results and survival rates were obtained with the Arpe prosthesis at mid-term, but longer-term survival rate is likely to decrease.

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