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Original article

Arthroplasty of the proximal interphalangeal joint with the TACTYS® prosthesis: Preliminary results after a minimum follow-up of 2 years

Arthroplastie de l'articulation interphalangienne proximale par prothèse TACTYS® : résultats préliminaires avec un recul minimum de 2 ans

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Abstract

The TACTYS® implant is a new anatomic gliding articular and modular prosthesis for the proximal interphalangeal (PIP) joint. We report preliminary results with a minimum follow-up of 2 years. Twenty-two patients with a mean age of 63 years were operated on at a single center by two senior hand surgeons. Indications were painful and stiff PIP joints. The joint damage was caused by osteoarthritis (18 cases), post-traumatic arthritis (3) and rheumatoid arthritis (1). All prostheses were implanted through a dorsal mid-line transtendinous approach. Postoperative active and passive range of motion in flexion and extension was performed immediately with a protective splint for 2 weeks. All patients were evaluated (pain, range of motion, strength, function, X-rays) with a mean follow-up of 34 months (range 24–50). Pain decreased from 6.5 preoperatively to 1.9 postoperatively on a VAS scale. Flexion–extension range of motion increased from 39° preoperatively to 58° postoperatively. Grip strength was 21 kg preoperatively and 25 kg postoperatively. Pinch strength was 3 kg preoperatively and 5 kg postoperatively. Functional QuickDASH and PRWE scores were significantly improved at the last follow-up. Four patients were reoperated on: dorsal tenoarthrolysis in 3 cases and volar osteophyte removal in 1 case. All implants were still in place at the last follow-up. On X-rays, there were no signs of implant migration or loosening. The modularity of the prosthesis seems to be this implant's greatest advantage. The TACTYS® prosthesis is a reliable alternative to other conventional PIP implants.

Keywords: Arthritis; Arthroplasty; Proximal interphalangeal joint; Hand surgery; Prosthesis

Résumé

La prothèse TACTYS® est une prothèse totale pour l'articulation interphalangienne proximale (IPP), à glissement, non-contrainte, anatomique à 4 composants modulaires. L'objectif était de rapporter nos résultats préliminaires avec un recul minimum de 2 ans. Vingt-deux patients d'âge moyen 63 ans ont été opérés dans un même centre par deux chirurgiens seniors. Les indications étaient des articulations IPP arthrosiques et douloureuses. L'arthrose était primitive dans 18 cas, post-traumatique dans 3 cas et rhumatoïde dans 1 cas. Toutes les prothèses ont été implantées par voie dorsale médiane transtendineuse. Une mobilisation postopératoire active et passive en flexion–extension a été réalisée immédiatement sous couvert d'une attelle pendant deux semaines. Tous les patients ont été évalués cliniquement (douleur, force, mobilités, scores fonctionnels QuickDASH et PRWE) et radiologiquement, avec un recul moyen de 34 mois (24 à 50). Cliniquement, on notait une amélioration significative de la douleur (1,9 contre 6,5 en préopératoire sur une échelle visuelle analogique), de la force de serrage (25 kgF contre 21 kgF), de préhension (5 kgF contre 3 kgF), des amplitudes de flexion–extension (58° contre 39°) et des scores fonctionnels QuickDASH (52,2/100 contre 22,5/100) et PRWE (51,5/100 contre 18,2/100). Quatre patients ont été réopérés : ténoarthrolyse dorsale dans 3 cas et résection d'ostéophyte antérieur dans 1 cas. Aucun implant n'a été retiré. Il n'y avait aucun cas de fracture, d'enfoncement, ou de descellement d'implant.

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Les résultats à court terme de ce nouvel implant semblent prometteurs. La prothèse TACTYS® peut être proposée comme une alternative fiable aux autres implants conventionnels.

Mots clés : Arthrose ; Arthroplastie ; Articulation interphalangienne proximale ; Chirurgie de la main ; Implant articulaire ; Prothèse

1. Introduction

Proximal interphalangeal (PIP) arthroplasty is a surgical option for managing painful advanced osteoarthritis, rheumatoid arthritis and post-traumatic arthritis cases that are resistant to well-conducted conservative therapy [1]. Swanson [2] pioneered the use of silicone implants in the 1960s. These consisted of a soft monoblock spacer acting as a hinge. They remain in routine use today thanks to their ease of installation and their reasonably predictable effect on pain. Nevertheless, range of motion outcomes are less impressive and implant longevity remains a problem [3]. Subsequently [4], other types of constrained metal implants were developed, followed by semi-constrained and non-constrained implants with gliding capability using a metal/polyethylene bearing. More recently [4,5], non-constrained pyrocarbon prostheses have appeared. A search of the literature [4,5] reveals many studies featuring these various implant. They describe good results in terms of pain reduction but the range of motion results are less satisfactory with numerous complications and revision procedures reported. The most serious of these is the fixation in the joint and implant stability.

The TACTYS® prosthesis is a new, non-constrained, gliding prosthesis that has an anatomical design and four modular components. This study reports preliminary results for PIP arthroplasty using the TACTYS® prosthesis with a minimum of 2 years' follow-up from a single center.

2. Methods

2.1. TACTYS® prosthesis

The TACTYS® prosthesis (Stryker-Memometal, Bruz, France) is a fully modular, gliding, non-constrained, total PIP joint prosthesis. It consists of four separate components. The proximal and distal intramedullary stems are anatomically designed and made from titanium alloy with a hydroxyapatite coating on the epiphyseal-metaphyseal portion, which allows press-fit insertion to achieve optimal anchorage. The bearing surfaces are anatomically designed; the proximal surface is made from polyethylene and the distal surface is made from cobalt-chrome alloy. All stems and surfaces are compatible with each other, fully interchangeable and available in a range of sizes. Proximal and distal stems are available in four sizes: XS, S, M and L. Proximal and distal bearing surfaces are available in three sizes: S, M and L. Three different thicknesses of distal bearing surfaces (−, 0, +) are available for each of the three prosthesis sizes to ensure appropriate joint tension (Fig. 1).

2.2. Surgical technique

All patients were positioned supine under local anesthesia, with a tourniquet inflated at the base of the arm. Using a dorsal approach, an approximately 3-cm long curvilinear incision was made over the PIP joint. A mid-line incision of the extensor mechanism was made longitudinally, centered on the central slip, passing through the middle of the joint and ending halfway along the proximal phalanx, so as to spare the underlying tendinous gliding tissue. The central slip was detached from the base of the middle phalanx. The resulting two flaps were reflected on either side to expose the joint.

The first bone procedure involved resection of the proximal articular surface. The condyles of the proximal phalanx were resected with an oscillating saw. The second bone procedure involved resection of the distal articular surface. A minimal cut at the base of the middle phalanx was made using the oscillating saw. Importantly, during these two procedures, particular care was taken to spare the insertions of the collateral ligaments and obtain a level surface on each side, perpendicular to the phalanx axis. The aim was to position both resected surfaces opposite one another and at right angles to the phalanx axis. Dorsal osteophytes were resected as needed.

The next step involved preparing the medullary canal of the proximal phalanx followed by that of the middle phalanx using specific instrumentation to accommodate the proximal and distal stems of the prosthesis. During this step, fluoroscopy was used to ensure the intramedullary stems were perfectly aligned along the axis of the phalanx and in the two spatial planes. At this stage, bone resection was completed using the cutting guide and the volar plate was removed at the level of the proximal phalanx.

Trial stems and bearing surfaces were then inserted to determine which sizes were required. During this step, joint tension was evaluated using the tenodesis effect: during flexion–extension of the wrist, the tenodesis effect of the extensor mechanism must allow complete flexion and extension of the joint. Lateral stability was also verified.

The selected implants were then inserted after verifying the positioning of the trial implants and the absence of osteophytic obstacles with radiographs.

In some cases, the central slip was reattached to the base of the middle phalanx using two transosseous sutures if this did not in any way restrict passive flexion of the PIP joint during mobilization by the tenodesis effect after implant insertion. If this was not the case, the central slip was not reattached. The extensor mechanism was then closed using slow-absorbing sutures while continuing to monitor tension.