

Pyrocarbon interposition arthroplasty for failed total wrist arthrodesis

Dear Sir,

The treatment of failed wrist surgery associated with major articular damage is challenging (Gaspar et al., 2015). In most cases, total wrist arthrodesis, via a variety of surgical techniques, is considered the only possible salvage procedure (Adams et al., 2016; Gaspar et al., 2015). Successful fusion provides a stable and pain-free wrist at the expense of mobility and some degree of lost function (Adams et al., 2016). This potential disadvantage is of concern where wrist motion and function are more important than the ability to bear weight.

As a solution for previous failed wrist procedures that relieve pain and maintain motion as well, wrist arthroplasty is an alternative treatment for failed partial wrist arthroplasty (Bellemere et al., 2012; Marcuzzi et al., 2014). There is no standard motion-restoring technique for surgical revisions of failed total wrist arthrodeses. We describe the conversion from a failed total wrist arthrodesis, due to nonunion, to a pyrocarbon interposition wrist arthroplasty.

A 70-year-old, right-handed man had fallen on his wrists. He had previously undergone a right total wrist arthrodesis with a 3.5mm dorsal steel plate (Synthes, Solothurn, Switzerland) for inflammatory arthropathy. Now 19 years subsequently, clinical examination revealed extensor synovitis due to prominent hardware with pain-free movement of 15°/10° for flexion–extension and 0°/5° for radial–ulnar deviation. Radiographs showed plate breakage through the unfilled screw hole. Computed tomography revealed fusion of the radiolunate joint and nonunion of the radioscapoid, midcarpal and carpometacarpal joints. The patient requested restoration of mobility in his wrist. He was not satisfied with the result of the total wrist arthrodesis due to persistent pain over the plate and he pointed out that his functional needs for work had changed since surgery. The broken plate and all screws were removed. A radiolunate osteotomy then allowed for a modified

proximal row carpectomy. A pyrocarbon implant (Ascension® MCP, Austin, TX, USA) was placed in the capitate as an interposition arthroplasty. The mobilized dorsal capsule was reattached by two bone anchors in the dorsal aspect of the radius. At his 3-year follow-up appointment the patient had a painless range of motion of 40°/35° of flexion–extension and 6°/20° of radial–ulnar deviation. Pre- and post-operative grip strengths were 7 kg and 17 kg. The visual analogue scale score changed from 9 preoperatively to 2 post-operatively. The disability of the arm, shoulder, and hand scores changed from 71 to 14. Radiographs demonstrated osteolysis around the stem of the implant without signs of instability or subsidence (Figure 1).

Nonunion is the most common reason for total wrist arthrodesis failure, which occurs in up to 7% of patients (Adams et al., 2016; Gaspar et al., 2015), usually resulting either from poor surgical technique or from failure of fixation. The most commonly selected option in such cases is a second attempt at fusion using bone graft and a new plate (Adams et al., 2016; Gaspar et al., 2015). Vascularized bone transfer is a more elaborated option. All of these options were disregarded because the patient wanted improved wrist motion. Given the strict restrictions recommended for patients under consideration for total wrist arthroplasty (Adams et al., 2016; Gaspar et al., 2015), that procedure was not feasible in this case.

Pyrocarbon prosthesis resurfacing of the capitate was used in this case as a custom salvage solution for the failed total wrist arthrodesis. The aim of this approach was to have a pain-free and at least somewhat mobile wrist. We modified the standard technique (Marcuzzi et al., 2014) for performing a pyrocarbon interposition arthroplasty after completing a modified proximal row carpectomy. Although the pyrocarbon interposition arthroplasty could have been done in the midcarpal joint, we performed a radiolunate osteotomy to complete the proximal row carpectomy in order to avoid a constricted arthroplasty. Pyrocarbon interposition arthroplasty is an alternative to total wrist arthrodesis when marked degenerative changes exist at the radiolunate joint, capitate head or both (Bellemere et al., 2012; Marcuzzi et al., 2014). Autologous fibrous tissue has been successfully used in interposition arthroplasty



Figure 1. (a) Anteroposterior and (b) lateral radiographs of the wrist demonstrating the broken plate. (c) Coronal computed tomography image showing fusion of the radiolunate joint and nonunion of the midcarpal joint. (d) Three-year postoperative anteroposterior and (e) lateral radiographs after modified proximal row carpectomy and pyrocarbon prosthesis resurfacing of the capitate.

too, but we preferred the pyrocarbon implant, based on the experience of others with this kind of implant (Bellemere et al., 2012; Gaspar et al., 2015; Marcuzzi et al., 2014). This implant needs adequate bone stock to support it (Bellemere et al., 2012; Marcuzzi et al., 2014). Even with the latest implants and techniques, the durability of wrist arthroplasty components remains limited (Bellemere et al., 2012; Marcuzzi et al., 2014). This modified interposition arthroplasty increases the operative options for challenging clinical scenarios such as the one we describe.

Declaration of Conflicting Interests The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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doi: 10.1177/1753193417723272 available online at journals.sagepub.com/home/jhs