Metacarpophalangeal Joint Pyrocarbon Arthroplasty for Osteoarthritis: an Analysis of 44 Consecutive Arthroplasties

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INTRODUCTION:

Osteoarthritis affecting the metacarpophalangeal (MCP) joint can be painful and functionally limiting. MCP arthroplasty can relieve pain and preserve function in severe cases of MCP arthritis. Patients specifically affected by noninflammatory MCP arthritis have shown to benefit from arthroplasty.

Since the landmark paper by Swanson in 1972, the silicone implant remains the gold standard in MCP arthroplasty. However, studies have demonstrated a high rate of implant fracture, recurrent deformity, joint instability, and limitations in motion, in part due to the "pistoning" effect of this flexible spacer and its deterioration over time. Pyrocarbon implants were designed to overcome some of these deficiencies with a semi-constrained design and elastic modulus similar to cortical bone. These implants were thought to optimize the stress transfer through the implant-bone interface. In addition, the pyrocarbon implant requires minimal bone resection, and evidence suggests excellent wear properties, with no reports of inflammatory reaction in response to wear particles. The newer-generation pyrocarbon implants, utilized at this institution since 2001, were modified with enlarged press-fit stems to minimize risk of implant loosening/migration, and the dorsal surface of the proximal component was extended to prevent volar subluxation.

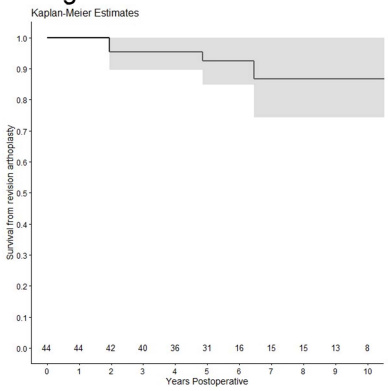
The objective of this study was to analyze postoperative outcomes in a large group of patients who underwent metacarpophalangeal (MCP) arthroplasty utilizing a pyrocarbon prosthesis for non-inflammatory arthritis.

METHODS: An analysis of 44 consecutive MCP joint arthroplasties over a 12 year time period in 30 patients with >2 years of follow-up was reviewed. The mean age was 63 years. The primary operative indication was pain and stiffness from osteoarthritis refractory to non-operative management for all arthroplasties.

RESULTS: At a mean follow-up of 6±3 years, 8 (18%) joints underwent reoperation, including 5 (11%) that underwent revision arthroplasty. The 2 and 5-year survival-free of revision arthroplasty were 95% and 93%, respectively (Figure 1). One (2%) operation was complicated by intraoperative fracture. Postoperative complications occurred in 8 (18%) fingers and included ligament/tendon rupture (n=3) and instability (n=2) (Table 1). There was significant postoperative improvement in pain levels, MCP arc of motion, pinch, and grip strengths (Table 2). At a mean 5 years of radiographic follow-up, 7% had progressive implant instability due to grade 3 or greater loosening. No joints experienced implant instability from progressive subsidence.

DISCUSSION AND CONCLUSION:

MCP arthroplasty using a pyrocarbon implant for osteoarthritis demonstrates an 8% revision rate at 5 years postoperative. Complications lead to reoperation in one of five arthroplasties. Radiographic evidence of implant instability was uncommon. Overall, patients experienced predictable pain relief and improvements in their range of motion and pinch strength.



Arthroplasties requiring revision	5 (11%)
Indication for revision	
Ulnar deviation	3
Limited motion	2
Subluxation	1
Joints requiring reoperations	8 (18%)
Reoperation indications	
Revision	5
Ligament/tendon repair	4
Debridement	2
Other*	2
Joints with at least 1 postoperative complication	8 (18%)
Total complications	12
Ligament/tendon rupture	3 (25%)
Instability	2 (17%)
Delayed healing/drainage	2 (17%)
Superficial infection	2 (16%)
Ligament loosening	1 (8%)
Other**	2 (16%)

*Other reoperations included deep suture removal (n=1), and scar revision (n=1).
** Other complications included vascular complication (n=1) and heterotopic bone (n=1)

Outcome measure	Preoperative	Postoperative	*p*
Greater than mild pain at joint	97%	13%	<0.01
MCP arc of motion	46° (range, 15-90°)	61° (range, 34-107°)	<0.01
Pinch strength	3.6 kgf (range, 1-9 kgf)	7.1 kgf (range, 4-10 kgf)	<0.01
Grip Strength	18.2 kgf (range, 8-29)	24.5 kgf (range, 5-40)	0.01

Kgf: kilogram-force