SCIENTIFIC ARTICLE

Intraoperative Periprosthetic Fractures Associated With Metacarpophalangeal Joint Arthroplasty

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Purpose To assess the incidence of and identify risk factors for intraoperative periprosthetic fractures during primary and revision metacarpophalangeal (MCP) joint arthroplasty.

Methods Through our institutional Joint Registry Database, we identified 818 MCP joint arthroplasties performed in 285 patients from 1998 to 2012, including 690 primary arthroplasties and 128 revision arthroplasties. Primary diagnoses included inflammatory arthritis (667), osteoarthritis (75), and posttraumatic arthritis (76). Periprosthetic fractures were identified through review of medical records.

Results Intraoperative periprosthetic fractures occurred in 23 (3%) fingers (21 patients), including 19 primary and 4 revision arthroplasties. Twelve fractures required stabilization, 4 required only bone grafting, and 1 required both. The fractures occurred during broaching (12), implantation (10), or prior implant removal (1). Diabetes mellitus (DM), younger age, pyrocarbon implant insertion, and cementless fixation increased risk for intraoperative fracture. In particular, DM and the use of pyrocarbon implants significantly increased fracture risk. At 4 years (range, 1.3–10.2 y) average follow-up, no patient with intraoperative fracture had developed a subsequent fracture compared with 3 postoperative fractures in patients without intraoperative fractures. All fractures had healed by the time of the last follow-up. The 2- and 5-year implant survival rates were 96% and 80% in those with intraoperative fractures, respectively, which was not significantly different from those without an intraoperative fracture. When comparing patients with an intraoperative fracture with those without, there was an increased risk of postoperative MCP joint instability defined as implant dislocation. Patients with intraoperative fractures still had noteworthy improvements in their postoperative pain levels and pinch strengths.

Conclusions Intraoperative fractures occurred in 3% of MCP joint arthroplasties, including 3% of primary and 3% of revision arthroplasties. Increased risk for fracture was associated with the use of pyrocarbon implants, cementless fixation, and DM. Although these fractures did not appear to adversely affect implant survival, they were associated with increased risk of postoperative instability. *(J Hand Surg Am. 2015;40(5):945–950. Copyright © 2015 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Prognostic III.

Key words Metacarpophalangeal arthroplasty, intraoperative fracture.

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Each author certifies that his or her institution approved the human protocol for this investigation and that all investigations were conducted in conformity with ethical principles of research.

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METACARPOPHALANGEAL (MCP) joint implant arthroplasty is a common treatment for end-stage joint degeneration with reasonable short-term survival rates and good pain relief and maintenance of joint range of motion.[1–3] Complications associated with these procedures including implant fracture, joint instability, and joint stiffness.[2,3] Complications of periprosthetic fractures in other joints such as the shoulder have been reported,[4] but the incidence of intraoperative complications and their effect on postoperative outcomes have not been well established. The objective of this study was to assess the incidence, early outcomes, and risk factors associated with intraoperative periprosthetic fracture during primary and revision MCP joint arthroplasty.

MATERIALS AND METHODS

Following approval of our institutional review board, we performed a review of intraoperative periprosthetic MCP joint arthroplasties using our institutional Joint Registry Database,[5] which has prospectively collected preoperative and postoperative information on every patient who has undergone a total joint arthroplasty at our institution since 1976. Before and after surgery at years 1, 2, 5, and 10, and every 5 years thereafter, clinical information is obtained by trained staff through either interviews and examinations or questionnaires if the patients are unable to follow-up in person. We used validated automated digital algorithms to identify Charlson comorbidities and perioperative factors from the patient's electronic medical records for those patients who underwent MCP joint arthroplasties.[6]

Demographic data

From 1998 to 2012, 818 MCP joint arthroplasties (690 primary and 128 revision) in 269 patients were performed at our institution. Four hundred sixty-six were silicone, 257 were pyrocarbon, and 95 were metal-plastic implants. The primary diagnoses were inflammatory arthritis (667), osteoarthritis (OA; 75) and posttraumatic arthritis (76). Any patient who did not consent to follow-up through the Registry was excluded.

Twenty-three arthroplasties (19 primary and 4 revision) in 21 patients were complicated by intraoperative periprosthetic fractures. Identification and location of the fractures were confirmed by medical review after initial identification using the Joint Registry.

Clinical evaluation

Review of the patient's medical record identified demographic data, comorbidities, operative indications and findings, joint survivorship, and postoperative complications. Risk stratification for intraoperative periprosthetic fractures was then performed using these variables. Medical record review and the Joint Registry were then used to assess complications and subsequent surgeries. Results from the patient's last clinic visit combined with questionnaires from the Joint Registry were used to calculate the preoperative and postoperative finger pain and range of motion. Pain was graded as none, mild, moderate, or severe, according to our standard Joint Registry questionnaire. Grip strength was calculated using a dynamometer (Jamar, Cambridge, MA) and reported in kilograms. MCP joint instability was defined as an MCP joint dislocation as determined by the surgeon or examining physician (M.R.). Radiographs were reviewed for signs of refracture, nonunion of the fractures, and implant dislocation at the last clinical follow-up.

Statistical analysis

To compare preoperative and postoperative variables, as well as the association of different variables with intraoperative fractures, we used the chi-square test (or Fisher exact test) for categorical variables, and we used the unpaired Student *t* tests to assess continuous variables. The Kaplan-Meier method was used to construct survival curves, with the log-rank test used to analyze different variables. The relative risk was calculated for each subgroup compared with the cohort. We were limited to performing univariable analysis given the limited number of fractures and postoperative complications. We considered a *P*-value less than .05 statistically significant.

RESULTS

Intraoperative fractures

Intraoperative periprosthetic fractures occurred in 23 (3%) fingers in 21 patients. The fractures occurred in 19 women and 4 men with an average age of 55 years (range, 31−72 y). No patients worked as laborers, 2 were active smokers, 8 had diabetes mellitus (DM). Two patients were taking prednisone and 7 were taking methotrexate around the time of surgery, including 1 patient with concomitant DM. Preoperative diagnoses for these patients included rheumatoid arthritis (RA) or juvenile RA (17), OA (1), and posttraumatic arthritis (5). Three patients had prior MCP joint instability.

The majority of fractures (n = 20) occurred during primary MCP joint arthroplasty, and 3 occurred during revision procedures. Two patients, both with RA, sustained intraoperative fractures in 2 fingers during primary arthroplasties. The first patient sustained