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Original Research

Routine Postoperative Radiographs Do Not Affect Decision Making Following Carpometacarpal Arthroplasty

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Purpose: Arthritis of the first carpometacarpal (CMC) joint affects up to 15% of the population aged over 30 years and 40% of the population aged over 50 years. Arthroplasty of the first CMC joint is a widely accepted treatment option for these patients, with most patients doing well long term despite radiographic evidence of subsidence. Postoperative treatment protocols vary with no defined gold standard, and the need for routine postoperative radiographs has not been defined. The purpose of this study was to evaluate the use of routine postoperative radiographs following CMC arthroplasty.

Methods: A retrospective review of patients who underwent CMC arthroplasty from 2014 to 2019 at our institution was performed. Patients receiving a concomitant trapezoid resection or metacarpophalangeal capsulodesis/arthrodesis were excluded. Demographic data, as well as the frequency and timing of postoperative radiographs, were collected. Radiographs were included if taken up to 6 months from the date of surgery. The primary outcome was a repeated operative intervention. Descriptive statistics were used for the analysis.

Results: A total of 155 CMC joints from 129 patients were included in the study. Sixty-one (39.4%) patients had no postoperative radiographs, 76 (49.0%) patients had one postoperative radiographic series, 18 (11.6%) had two, 8 (5.2%) had three, and 1 (0.6%) patient had four postoperative series of radiographs. A radiographic series is defined as multiple views taken at a single time point. Four of 155 (2.6%) patients underwent additional operative intervention. There were no patients who underwent revision CMC arthroplasty. Two had wound infections that underwent irrigation and debridement. Two developed metacarpophalangeal arthritis and underwent arthrodesis. There were no cases where repeat operative intervention was driven by postoperative radiographic findings.

Conclusions: Routine postoperative radiographs following CMC arthroplasty do not lead to changes in patient management, specifically further surgery. These data may support forgoing routine radiographs in the postoperative period following CMC arthroplasty.

Type of study/level of evidence: Therapeutic IV.

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Arthritis of the first carpometacarpal (CMC) joint affects up to 15% of the population aged over 30 years and 40% of the population aged over 50 years.^{1,2} Carpometacarpal arthroplasty is a commonly used treatment option for patients failing conservative management. Revision rates of CMC arthroplasty have previously been reported as low as 2.5% to 2.9%.^{3,4} Radiographs can be used to

assess first metacarpal subsidence, scaphotrapezoid arthritis, or impingement.⁵ Metacarpal subsidence has been shown not to correlate with thumb strength.⁶ At this time, there are no clear guidelines regarding radiographs during the postoperative period following CMC arthroplasty.

Radiographs contribute an increased cost for these patients, as well as exposure to ionizing radiation. Keeping cost of care in mind has been an increasingly anticipated expectation for physicians.⁷ Following distal radius fracture repair, routine follow-up radiographs were shown to rarely affect management and radiographs were shown not to affect reoperation rate.^{8–10} Radiographs have also been proven not to be cost effective for routine care of wrist ganglion cysts, as shown by Wong et al.¹¹ In addition, it has been

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demonstrated that radiographs do not have an impact on the patient's satisfaction with their postoperative clinic visits.¹² According to these studies, routine postoperative radiographs for many routine hand surgical procedures provide little clinical benefit and increase costs.

Although frequent postoperative radiographs have been shown to have a minimal impact on decision making and to decrease cost effectiveness in other settings, there is a paucity of data on the use of routine postoperative radiographs as a standard for all patients following CMC arthroplasty. The purpose of this study was to determine the frequency of postoperative radiographs obtained following CMC arthroplasty and to assess whether the radiographs had an impact on clinical decision making. We hypothesized that the radiographs would not have an impact on clinical decision making following CMC arthroplasty, specifically the decision for further operative intervention.

Materials and Methods

Approval was received by the institutional review board at our institution before beginning the study. We conducted a retrospective review of all patients undergoing CMC arthroplasty (Current Procedural Terminology codes 25447 and 26480) by three fellowship-trained hand and upper extremity surgeons at our large academic institution from January 2014 to December 2019. During the collection period, the participating surgeons changed their practice from routine radiographs to not obtaining radiographs unless there were postoperative clinical concerns. This allowed for a distribution of patients both with and without radiographs. All three surgeons used the flexor carpi radialis interposition following trapeziectomy technique for all arthroplasties. Kirschner wire immobilization of the CMC joint was not routinely performed. The postoperative rehabilitation protocol varied slightly depending on the surgeon, but generally included splint or cast immobilization for 4 weeks, followed by hand therapy exercises to regain thumb mobility and strength. Exclusion criteria included patients receiving concomitant proximal trapezoid resection, metacarpophalangeal (MCP) capsulodesis or arthrodesis, Kirschner wire stabilization of the CMC or MCP joint, and revision arthroplasties.

Patient demographics, surgical data, and postoperative radiographic data were collected for each patient from electronic medical records. This included possible confounders, such as previous trauma to the operative extremity, previous surgery to the operative extremity, and concomitant carpal tunnel release at the time of surgery. Our primary outcome was to assess whether postoperative radiographs impacted management after the CMC joint of interest was returned to the operating room for any indication. The frequency and timing of postoperative radiographs were recorded. A postoperative radiograph was defined as a radiographic series obtained within six months of surgery. A radiographic series was defined as all radiographs received at one time point, ie, three views of the wrist and three views of the thumb at the same visit, which were considered to be one radiographic series.

Descriptive statistics were used for the analysis, given the rarity of our primary outcome.

Results

Our search returned 239 CMC arthroplasties of which 84 were excluded. Forty-three were excluded due to a concomitant proximal trapezoid resection; 28 received an MCP capsulodesis or arthrodesis, 8 had both a proximal trapezoid resection and an MCP capsulodesis or arthrodesis, 3 were revision arthroplasties referred from outside our institution, 1 patient had thumb interphalangeal arthrodesis, and 1 patient also received an ulnar shortening

Table 1
Demographic and Surgical Data

Surgical Data	Patients, n (%)
Age	63.11 (7.74)*
Sex	
Male	37 (23.9)
Female	118 (76.1)
BMI	29.49 (5.96)*
Smoking Status	
Never	105 (67.7)
Former	26 (16.8)
Current	24 (15.5)
Previous Surgery to Operative Extremity	
Yes	34 (21.9)
No	121 (78.1)
Previous Trauma to Operative Extremity	
Yes	10 (6.5)
No	145 (93.5)
Operative Side	
Left	81 (52.3)
Right	74 (47.7)
Hand Dominance	
Left	12 (7.7)
Right	131 (84.5)
Unknown	12 (7.7)
Surgery on Dominant Hand	
Yes	73 (47.1)
No	70 (45.2)
Unknown	12 (7.7)
Concomitant Carpal Tunnel Release	
Yes	47 (30.3)
No	108 (69.7)

BMI, body mass index.

* Signifies a continuous variable displayed as the mean (standard deviation).

osteotomy. After exclusions, 155 CMC arthroplasties from 129 patients remained and were included.

Our patient group was predominantly comprised of women (76.1%), with a mean age of 63 years. The mean body mass index level was 29.5, and 85% were current nonsmokers. Most had never had a previous surgery or trauma on the operative extremity (78% and 94%, respectively). Thirty percent of the patients underwent a concomitant carpal tunnel release at the time of their CMC arthroplasty (Table 1).

Patients received zero, one, two, three, or, in one case, four postoperative radiographic series on their operative wrist or thumb. Most of the patients in our group had either zero or one series (Table 2). The average time of the first radiographic series was postoperative day 51; the average time of the second series was postoperative day 83; and the average time of the third series was postoperative day 110. There were a total of four patients that had a return to the operating room—two for postoperative infections and two for an MCP arthrodesis outside of the early postoperative period (Table 2).

Discussion

Many patients receive postoperative radiographs following CMC arthroplasty. Whether these radiographs contribute to clinical decision making and the rate of returning to the operating room is an important question to answer. Although 103/155 (61%) of patients in our study received at least one postoperative radiograph, zero patients underwent a revision procedure, and only 4/155 (2.6%) had a return to the operating room for any reason. Of these four, two returned due to postoperative infections. One of these patients developed an acute postoperative infection and presented to the clinic 10 days after surgery with pain and erythema. A course of antibiotics did not resolve symptoms, and the patient was taken to

Table 2
Radiographic Data in the First Six Months after Surgery and the Need for Return to the Operating Room

Radiographic Series, n	Patients n = 155, n (%)	Return to Operating Room, n	Reason for Return to Operating Room	Days Out from Surgery Return to Operating Room, d
0	61 (39.4)	1	MCP arthrodesis	712
1	76 (49.0)	1	Postoperative infection	31
2	18 (11.6)	2	MCP arthrodesis postoperative infection	350 95
3	8 (5.2)	0	–	–
4	1 (0.6)	0	–	–

the operating room for an incision and drainage. The other returned infection was the result of a minor trauma in the postoperative period that resulted in a dehiscence of the surgical wound that ultimately led to an infection. Both of these patients received radiographs as a result of additional signs and symptoms outside of the normal expected postoperative course. The other two patients who had a return to the operating room both returned for MCP arthrodesis; however, the returns did not occur until 350 and 712 days after surgery, respectively.

Obtaining radiographs too frequently can contribute to increased cost, exposure to ionizing radiation, and the potential for misdiagnosis for patients. An effort to decrease the number of radiographs ordered can minimize these undue burdens. Stone et al⁸ analyzed the clinical use of routine postoperative radiographs in 508 distal radius fractures. Two hundred sixty-eight of these had a routine two-week postoperative radiograph, and 240 had no radiographs. In the imaged group, 3 (1.2%) of 268 patients had an unexpected change in management due to radiographic findings, defined as requiring open revision. In the unimaged group, 4 (1.7%) of 240 fractures had clinically meaningful radiographic changes, suggesting that the imaging did not have a considerable impact on clinical decision making.⁸ Similarly, there may be a role in decreasing routine imaging in CMC arthroplasty.

As the decision to proceed with additional surgery is a rare event following CMC arthroplasty and is often preceded by additional signs and symptoms suggestive of the benefit of radiographs, obtaining routine postoperative radiographs did not appear to add value to clinical management in our patient population. Radiographs should be reserved for when there is a clinical indication for imaging. Ghattas et al¹³ demonstrated that in a group of 200 acute fractures receiving routine radiographs at the first postoperative visit, only 15 (7.5%) had a clinical indication for imaging defined by an abnormal physical examination finding. Of these, only three (1.5%) had management that deviated from routine postoperative care.¹³ This supports the idea that surgeons have a tendency to order routine radiographs in the absence of clinical necessity.

Our data demonstrate that routine postoperative radiographs following CMC arthroplasty result in a return to the operating room only on rare occasions and often with accompanying signs and symptoms. Therefore, the routine use of these radiographs adds little use to clinical decision making in the absence of another indication for imaging. Abstaining from routine postoperative radiographs can spare patients undue cost and exposure to ionizing

radiation, and the authors recommend that imaging be reserved in these patients only for individualized indications rather than as the standard of care.

There were several limitations to this study. Our study's retrospective nature made it inherently weaker than a prospective randomized study. Additionally, our primary outcome of return to the operating room being a rare event in this population, decreases the strength of our analysis. However, we believe that the rarity of the primary outcome supports the applicability of the study, as our data suggests against the intervention. A large randomized controlled trial would produce stronger evidence, but we believe the data presented are valuable and suggest that radiographs should not be used routinely in this population.

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