Radiocapitate Congruency as a Predictive Factor for the Results of Proximal Row Carpectomy

Hubert Lenoir, MD, Adriano Toffoli, MSc, Bertrand Coulet, PhD, Cyril Lazerges, MD, Thomas Waitzenegger, MD, Michel Chammas, PhD

Purpose To evaluate whether the congruency between the joint surfaces of the lunate fossa of the distal radius and the proximal capitate might be a prognostic factor for functional, clinical, or radiographic results after proximal row carpectomy (PRC).

Methods After reconstructing the computed tomographic arthrogram of patients with PRC, we evaluated the shape of the proximal capitate by measuring the radius of curvature of the tip of the capitate. The congruency of the future radiocapitate joint was then evaluated by the radiocapitate index in the frontal and sagittal planes. This was calculated by dividing the radius of curvature of the tip of the capitate by the mean radius of curvature of the lunate fossa. We determined the relationship between these morphological results and the functional (Disabilities of the Arm, Shoulder, and Hand [DASH] score, Mayo Wrist score, and pain relief), clinical (mobility and strength) and x-ray results (radiocapitate arthrosis).

Results A total of 27 patients were reviewed at a mean follow-up of 59 months. The shape of the proximal capitate did not affect outcomes. In the frontal plane, a better radiocapitate congruency was significantly associated with an increase in wrist flexion and better functional results for the DASH. There was a non-significant relationship between congruency and improvement of Mayo Wrist score and pain relief. In the sagittal plane, the DASH score tended to improve when congruency was better.

Conclusions The shape of the capitate was not a prognostic factor for functional outcome after PRC. The radiocapitate index seems more relevant in predicting results at last follow-up. *(J Hand Surg Am. 2015;40(6):1088–1094. Copyright © 2015 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Prognostic II.

Key words Proximal row carpectomy, functional results, radiocapitate, congruency, wrist osteoarthritis.

Controversy exists regarding the optimal surgical procedure for patients with stage II scapholunate advanced collapse or scaphoid nonunion advanced collapse. When degenerative radioscaphoid lesions are present, the 2 possible choices are proximal row carpectomy (PRC) or partial wrist fusion (PWF) with scaphoid excision.[1] Proximal row carpectomy is technically less demanding and requires a shorter postoperative immobilization time.[1,2] It seems to be associated with fewer complications because of the absence of implant-related complications or nonunion.[1–4] Better ranges of flexion-extension have also been reported with this procedure compared with PWF.[3,4] Conversely, PRC induces a loss of strength owing to relative lengthening of the flexor tendons.[5,6] Proximal row carpectomy is also more prone to arthrosis perhaps because of a lack of congruency, especially in young manual workers.[2,5]

From the Hand and Upper Extremity Surgery Unit, CHRU Montpellier University Hospital, Montpellier, France.

Received for publication February 11, 2014; accepted in revised form February 10, 2015.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Corresponding author: Hubert Lenoir, MD, Service de Chirurgie de la Main et du Membre Supérieur, CHU Lapeyronie, 371 Avenue du Doyen Gaston Giraud, 34295 Montpellier Cedex 5, France; e-mail: hubert.lenoir@laposte.net.

0363-5023/15/4006-0003$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2015.02.019

Respective indications for PWF and PRC are currently mostly determined by the state of the cartilage on the proximal capitate and on the lunate fossa of the radius, patients' age, and their activity level. The importance of radiocapitate congruency in PRC has been incompletely studied.[7–9]

We hypothesized that the morphological characteristics of the lunate fossa and capitate should be considered when choosing between a PRC or PWF in cases of radioscaphoid degenerative lesions or Kienböck disease. We always evaluate the radiocarpal and midcarpal cartilage lesions with a preoperative computed tomographic (CT) arthrogram when choosing between a PRC or a PWF. This allowed us to determine whether the shape of the proximal capitate and preoperative radiocapitate congruency were prognostic factors for the functional outcomes of PRC.

MATERIALS AND METHODS

A total of 56 patients were treated by PRC from March 2004 to May 2010. Among these, 11 patients were lost to follow-up and 1 died. To attribute postoperative degenerative cartilage lesions to radiocapitate incongruency, we excluded all patients with cartilage damage of the proximal capitate or lunate fossa of the radius, even minor. Patients operated on in the context of neurological sequelae of the upper limb, those who had had another surgical procedure after PRC, and those who had not had a preoperative CT arthrogram were excluded. Minimum follow-up was 2 years. Twenty-seven patients were included and evaluated by an independent observer. There were 20 men and 7 women, mean age 51 ± 12 years at surgery. Twenty patients were manual workers. The dominant side was involved in 15 cases. There were 18 scapholunate advanced collapse wrists, 5 scaphoid nonunion advanced collapse wrists, and 4 cases of Kienböck disease.

The carpus was exposed by a dorsal skin incision through the third extensor compartment. We performed a resection of the posterior interosseous nerve in all cases. A capsulotomy was made and the cartilage on the head of the capitate and on the lunate fossa was inspected. Proximal row carpectomy was thus carried out. We used no additional internal fixation to stabilize the wrist and performed no styloidectomy. The wrist was immobilized in a forearm plaster cast for 3 weeks, at which time wrist motion exercises and physiotherapy were started.

At the last follow-up, we performed a subjective assessment of pain using a numerical scale of 0 to 10 under both stress and resting conditions. The Disabilities of the Arm, Shoulder, and Hand (DASH) score and Mayo Wrist Score (MWS) were recorded. Patient satisfaction was evaluated. We evaluated range of motion using a goniometer. Pinch strength and grip strength were measured using a Jamar dynamometer and compared with the contralateral side. Finally, anteroposterior and lateral radiographs of the wrist in neutral pronosupination were analyzed for radiocapitate arthrosis according to the classification of Culp et al[10]: grade I if no sign was present; grade II if there was moderate joint space narrowing; grade III for cases with an onset of subchondral sclerosis; and grade IV if there was joint destruction with complete narrowing, proximal capitate collapse, or subchondral cyst formation.

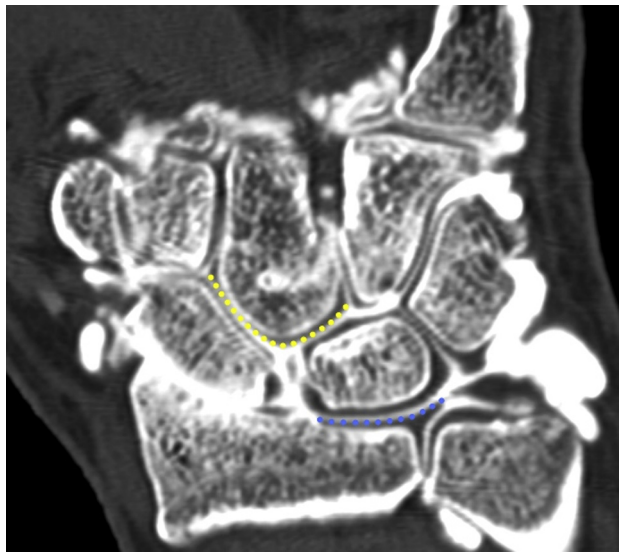

FIGURE 1: Distribution of joint landmarks evenly spaced over the lunate fossa of the radius (blue dots) and at the proximal capitate (yellow dots).

Arthrosis was graded by an orthopedic surgeon blinded to the CT arthrogram and preoperative radiographs.

The shape of the proximal capitate and the curvature radii of the lunate fossa and capitate were measured with preoperative CT arthrograms. Image data were transferred in DICOM format into Myrian software, version 1.8.3 (Intrasense, Paris, France). We retained scan slices on which there was the highest convexity for the capitate and the deepest concavity for the lunate fossa in the frontal and sagittal planes. After PRC, a point on the radial side of a slice can articulate with a point on the capitate side of a different slice. Thus, the radii of curvature on both sides were sometimes calculated on different slices. After identifying the joint surfaces, we recorded the digital coordinates for each joint surface on a succession of dots uniformly spaced at each millimeter (Fig. 1).