

Radiocarpal Fusion: Indications, Technique, and Modifications

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Learning Objectives

Upon completion of this CME activity, the learner will:

- Recognize and understand indications for radiocarpal arthrodesis.
- Understand different treatment options and surgical techniques for radiocarpal arthritis.
- Understand reported outcomes of different techniques for radiocarpal arthrodesis.

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Degenerative disorders of the wrist may affect isolated joints and inhibit normal functions of the wrist secondary to pain and stiffness. These processes that affect only the radiocarpal joint may be secondary to posttraumatic osteoarthritis, primary osteoarthritis, or rheumatoid arthritis. Radiocarpal wrist arthrodesis may help preserve some of the native wrist kinematics while alleviating pain and improving the range of motion. However, the surgeon must ensure

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that the patient's pathologic process primarily affects the radiocarpal articulations while relatively sparing the midcarpal articulations. Depending on the location of the pathology, isolated radiolunate or radioscapolunate arthrodesis have been described to preserve some motion in the midcarpal joint. To maximize motion in the midcarpal joint after radiocarpal arthrodesis, techniques for distal scaphoid and triquetrum excision have been described. We report patient outcomes for various techniques and describe our preferred technique for radioscapolunate arthrodesis using distal scaphoid excision. (*J Hand Surg Am.* 2022;47(8):772–782. Copyright © 2022 by the American Society for Surgery of the Hand. All rights reserved.)

Key words Arthrodesis, partial wrist fusion, radiocarpal fusion, radiolunate fusion, radioscapolunate fusion.

THE KINEMATICS OF THE WRIST joint in motion are complex.^{1,2} The earliest studies of the kinematics of the wrist conceptualized the carpus as 2 rows, proximal and distal, with motion in 2 planes, flexion or extension, and radioulnar deviation. As our understanding of the kinematics of the wrist evolved, the concept of the dart thrower's motion, which is fundamental to functional motion of the hand and wrist, was introduced.^{1,2}

Degenerative disorders of the wrist, such as rheumatoid arthritis (RA) and posttraumatic arthritis, may affect the normal functions of the joint, resulting in pain and stiffness.³ Partial wrist arthrodesis may help to preserve some of the kinematics of the native wrist while alleviating pain and improving the range of motion (ROM). Unlike total wrist arthrodesis, radiocarpal arthrodesis targets only diseased joints in the radiocarpal and proximal intercarpal articulations and preserves the axis of the dart thrower's motion, although with a diminished range.⁴

A number of radiocarpal arthrodeses of the wrist have been described, all of which aim to address the pathology while maximizing the postoperative ROM and functionality of the wrist.^{5–14} These include radiolunate (RL), radioscapolunate (RSL), and RSL arthrodesis using distal scaphoid excision and/or triquetrum excision (TE). All these options preserve the midcarpal joint, which has been shown to contribute to the wrist's ability to move along the dart thrower's motion.^{2,4} The purpose of this study was to review the indications for, techniques of, and modifications of radiocarpal arthrodesis.

INDICATIONS

The indications for radiocarpal arthrodesis include isolated RL or RSL arthritis in symptomatic

patients who have failed to respond to non-surgical treatment measures such as oral analgesia and orthosis fabrication in the wrist.³ The disease process may be secondary to posttraumatic osteoarthritis, primary osteoarthritis, or RA. Additionally, the surgeon must ensure that the patient's pathologic process primarily affects the proximal radiocarpal articulations while relatively sparing the midcarpal articulations. The lunatocapitate articulation must be disease-free, and in cases in which the distal scaphoid is not excised, the scaphotrapezium-trapezoid (STT) articulation should also be radiographically free of arthrosis.³

Posttraumatic arthritis

The sequelae of a distal radius fracture may lead to arthritic changes in the proximal radiocarpal articulations.¹⁵ For example, a “die-punch” type fracture that violates only the lunate fossa of the radius may lead to arthritic changes limited to the RL joint, making RL arthrodesis an appropriate treatment option. Some may consider RSL arthrodesis even in the setting of degenerative changes in isolated RL to allow for a sufficient fusion mass by involving a larger surface area. Similarly, comminuted intra-articular distal radius fractures may involve both the RL and radioscapoid (RS) joints, in which case RSL arthrodesis may help best address the pathology (Fig. 1).^{16,17}

RA

Before the advent of disease-modifying antirheumatoid drugs, RA frequently led to progressive pain and deformity of the wrist, the most common being volar-ulnar subluxation of the carpus of the radius and ulna.¹⁸ However, the widespread use of these medications has substantially reduced articular sequelae and improved function in patients with RA.¹⁹ The concept of partial wrist arthrodesis as a

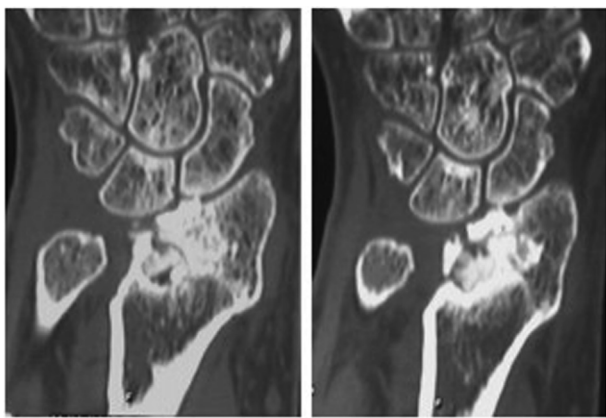


FIGURE 1: Posttraumatic arthritis in the setting of a previous comminuted, intra-articular distal radius fracture that involved both the RL and radioscaphoid joints.

treatment for RA arose based on observations of patients with spontaneous RL fusion who had notable pain relief, functional ROM, and stabilization of their progressive ulnar translation deformity due to a bony block created by the fusion mass.¹⁰ Chamay and Vilaseca⁸ first described RL arthrodesis as a treatment option for wrists with RA in 1983.

DIFFERENT OPTIONS FOR RADIOCARPAL FUSION

RL arthrodesis

Isolated RL arthritis secondary to posttraumatic arthritis may be addressed with RL arthrodesis. Similarly, RL arthrodesis may be used to prevent volar and ulnar translation of the carpus in the setting of RA.^{8,10} Table 1 summarizes the outcomes of RL arthrodesis based on published series.^{20–24}

Raven et al²⁵ performed a retrospective analysis of 23 wrists in 20 patients with RA or psoriatic arthritis treated with RL (n = 19) or RSL (n = 4) arthrodesis. Fixation was achieved using titanium staples in all the cases. All the patients underwent synovectomy and bone grafting using a cancellous graft harvested from the resected ulnar head. The distal pole of the scaphoid was not resected. At follow-up (mean, 11.3 years), all the wrists treated with RL arthrodesis demonstrated complete fusion, but 3 of the 4 wrists treated with RSL arthrodesis demonstrated incomplete fusion at the radioscaphoid interval. The incomplete fusion at the radioscaphoid interval was not associated with the patients' outcomes. There was a trend toward increased ROM in the coronal plane and while in extension, although the extension level decreased to preoperative levels at the final follow-up.

Flexion remained at preoperative levels. Radiographically, all the wrists demonstrated progression of disease, as measured using the modified Larsen score, which is used to quantify the degree of joint degeneration at numerous articulations in the wrist and combine them into 1 score.²⁶ The carpal height ratio, a measurement of the degree of carpal collapse, remained stable before and after the surgery. The ulnar translation index, a measure of the degree of instability, decreased at the final follow-up. Finally, the pain score, as measured using the visual analog scale, and grip strength did not change between intermediate and long-term follow-up despite the progression of disease detected radiographically. At the final follow-up, the visual analog scale scores averaged 20/100, and the grip strength averaged 12.7 kg, which were interpreted as overall good outcomes for the cohort.

Motomiya et al¹² performed a similar analysis in 22 wrists of 19 patients treated with RL arthrodesis for RA. Fixation in these cases was achieved using K-wire fixation with a wire directed from the triquetrum to the radius, combined with a single headless, cannulated screw between the radius and lunate (Fig. 2). A distal ulnar bone graft was used to supplement the fusion. All the wrists demonstrated complete fusion in this series. Significant increases in grip strength and supination ROM were seen at the final follow-up. Flexion and extension ROMs were decreased at the final follow-up. Unlike the prior study, the Larsen grade of rheumatic disease did not progress over the course of the study, a finding that the authors attributed to concomitant treatment of their patients with disease-modifying antirheumatoid drugs. The carpal height ratio increased immediately after the surgery and remained stable, whereas the ulnar translation index decreased immediately after the surgery and then stabilized. Despite the decrease in flexion and extension ROMs, the Mayo wrist score improved significantly in all the patients, and 13 patients had outcomes that were classified as excellent, with 9 classified as good, based on the Stanley classification.¹²

RSL arthrodesis

For patients with both radioscaphoid and RL arthrosis in whom nonoperative treatment measures have failed, RSL arthrodesis may be indicated. Once again, relative sparing of other midcarpal articulations is preferred. Table 2 summarizes the outcomes of RSL arthrodesis with or without excision of the distal scaphoid pole and/or TE based on published series.^{11,27}

TABLE 1. Summary of Outcomes of RL Arthrodesis

	Motomiya et al, ¹² 2013	Raven et al, ²⁵ 2012	Honkanen et al, ²⁰ 2007	Ishikawa et al, ²¹ 2005	Esenwein et al, ²² 2004	Jüsten and Wessinghage, ²³ 2003	Borisch and Haussmann, ²⁴ 2002	Stanley and Boot, ⁴⁰ 1989	Linscheid and Dobyns, ¹⁰ 1985
Patients	19	38	20	25	30	17	78	50	20
Wrists	22	46	23	25	32	19	91	57	22
Larsen score	4-Mar	1–2	2–3	2–4	0–3	4	2–4	2–3	
RL fusion	22	33	16	16	28	19	91	16	22
RSL fusion	0	13	7	7	4	0	0	0	0
Avg follow-up (y)	7	11.3	5.8	13	1.5	2	5	2	2
VAS		2	<1	<1	3		2	3	
Δ Flex/ex ROM (°)	–22	–12	–15	–18	–33		–28	–4	–42
Δ Grip strength (kg)	6	N/A	3	5				5	3
Radiographic disease progression	No	Yes	Yes	Yes		No	Yes		
Patient satisfaction	High	Good	High	High	Moderate–high	High	High	Moderate–high	Moderate–high

Avg, average; Flex/ex, flexion/extension; VAS, visual analog scale.

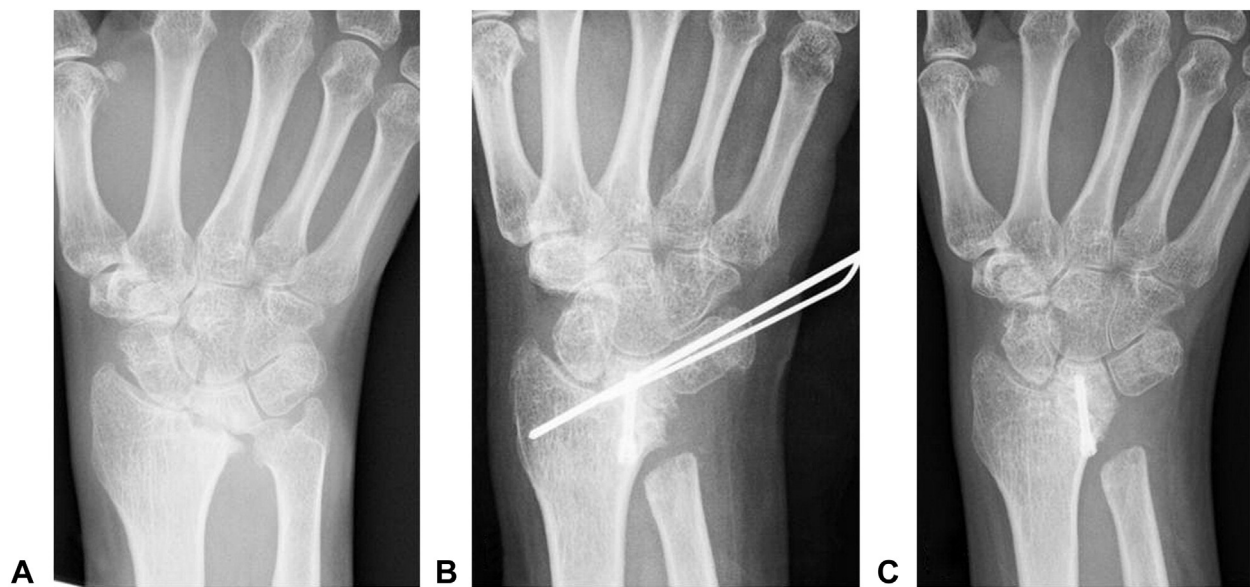


FIGURE 2: Radiographs of an RL arthrodesis technique described by Motomiya et al.¹² **A** Preoperative radiograph demonstrating RL arthritis. **B** The authors use a wire directed from the triquetrum to the radius, combined with a single headless, cannulated screw between the radius and lunate to achieve the arthrodesis. **C** Final post-operative radiograph demonstrating removal of the wire and fusion across the RL joint.

Nagy and Büchler¹³ performed a retrospective review of 15 patients treated with RSL arthrodesis for posttraumatic arthritis, with long-term follow-up (mean, 8 years). In their cohort, nonunion of the fusion mass with persistent wrist pain with moderate levels of activity developed in 2 patients, who underwent revision with total wrist arthrodesis. Midcarpal arthritis developed in another 3 patients and required conversion to wrist arthrodesis because of persistent and worsening pain. Two additional patients had a nonunion that did not necessitate total wrist arthrodesis. The other 8 patients remained satisfied with their pain control and function. The average ROM arcs were modest at the final follow-up.

Shin and Jupiter¹⁷ described a novel technique to achieve RSL fusion using a dual-plate construct (Fig. 3). After careful preparation of fusion sites with sufficient articular debridement, the authors applied a construct consisting of one 2.4-mm distal radius plate (Synthes Ltd) spanning the radio-scaphoid articulation and another spanning the RL articulation. A combination of locking screws and cortical screws was inserted to impart a fixed-angle construct and mild compression across the fusion sites. They reported successful fusion in all of their 5 patients; however, postoperative ROM data were not available.

Montoya-Faivre et al²⁸ described their results in 34 patients who underwent isolated RSL arthrodesis,

with a mean follow-up duration of 4.4 years. A dorsal approach through the fourth extensor compartment was used, along with a variety of fixation options, including K-wire fixation, memory staples, compression screws, and locking plates. A bone graft was taken from the distal radius, distal pole of the scaphoid, or iliac crest. Not all the patients underwent distal pole scaphoid excision. The authors reported a high nonunion rate of 29% (10 patients) and suggested that nonunions were seen more frequently (70% of the nonunions) in patients who did not undergo distal scaphoid excision (DSE). They reported flexion or extension and radioulnar deviation arcs of 56° and 30°, respectively, and grip strength that was 71% of the contralateral wrist. A total of 6 patients with a nonunion underwent another procedure (4 underwent wrist arthrodesis and 2 underwent revision fixation), whereas the rate of midcarpal arthritis was noted to be 64%.

Some authors have suggested that the high rate of nonunion seen with isolated RSL arthrodesis is secondary to increased stress placed between the proximal scaphoid and the fusion mass by the long lever arm of the scaphoid (Figs. 4, 5).¹¹ Significant increases in the contact pressure at the STT and lunatocapitate joints may be the cause for the increased rate of midcarpal arthritis noted after isolated RSL arthrodesis.²⁹ Similarly, limitations in ROM after RSL arthrodesis may be the result of a scaphoid being unable to flex after fusion to the radius. The scaphoid

TABLE 2. Summary of Outcomes of RSL Arthrodesis

	Nagy and Büchler, ¹³ 1997	Montoya- Faivre et al, ²⁸ 2017	Shin and Jupiter, ¹⁷ 2007	Bach et al, ²⁷ 1991	Garcia- Elias et al, ⁹ 2005	Mühdorfer- Fodor et al, ³¹ 2012	Biswas et al, ⁷ 2013	Quadlbauer et al, ³² 2017	Ha et al, ³³ 2018
Patients	15	34	5	36	16	35	9	11	8
Wrists	15	34	5	36	15	35	9	11	8
Avg follow-up (mo)	96	53		29	37	25	12	63	>120
DSE	No	No	No	No	Yes	Yes	Yes	Yes	Yes
TE	No	No	No	No	No	No	No	No	Yes
Immobilization (wk)	9.2			8	3–4	6	6–12	5 (PT allowed)	6
Flex/ex arc (°)	46.6	56	40	48	67	51		95	45
Radial/ulnar dev arc (°)	27.6	40		21	31	27		35	26
Grip strength (kg)	63% of contra. side	25		32		25		28	17
VAS	1.3	3		2.8		4		2	2
Nonunion rate (%)	27	29	0	5	0	9	0	0	0
% Converted to TWA	33	18	0	19	0	23	0	0	0
Patient satisfaction (%)	80	79				92			100

Avg, average; contra, contralateral; dev, deviation; Flex/ex, flexion/extension; PT, physical therapy; TWA, total wrist arthrodesis; VAS, visual analog scale.



FIGURE 3: Intraoperative image of RSL arthrodesis using a dual-plate construct, as described by Shin and Jupiter.¹⁷ After articular debridement of the proposed fusion site, the authors applied two 2.4-mm spanning plates for the radioscapoid and RL joints using a combination of locking and cortical screws.

typically flexes during wrist flexion and radial deviation, both of which are likely to be affected in the setting of RSL arthrodesis.^{11,30}

RSL fusion with DSE

To address the concerns of the high rates of nonunion, limitations in postoperative ROM, and high rates of progression of arthritis, some have advocated for DSE in addition to RSL arthrodesis.¹¹ It is felt that the resection of the distal scaphoid pole unlocks the midcarpal joint, allowing it more excursion during wrist flexion and radial deviation.¹⁴

Garcia-Elias et al⁹ reported their series of 16 patients treated with RSL arthrodesis using a K-wire construct and DSE, with a mean follow-up duration of 2.5 years. The authors compared the results of their patients with those of patients reported in the literature who underwent RSL arthrodesis alone. The group that underwent RSL arthrodesis + DSE reported no nonunions, significantly lower levels of pain, more motion in flexion (32° vs 18°, respectively) and radial deviation (14° vs 6°, respectively), and lower rates of midcarpal arthritis (12% vs 33%, respectively). The only 2 patients who experienced progression to midcarpal arthritis had a history of perilunate dislocation, which may have predisposed them to the development of progressive arthritis.

In a retrospective review of 61 patients, with a mean follow-up duration of 2.3 years, Mühldorfer-Fodor et al³¹ compared the outcomes of RSL arthrodesis alone (31 patients) with those of RSL arthrodesis + DSE (30 patients). In their cohort, 3



FIGURE 4: Nonunion between the radioscapoid joint after an attempted isolated RSL arthrodesis.

patients in the RSL arthrodesis-alone group had a nonunion, compared with no patients in the RSL arthrodesis + DSE group. The authors postulated that because the scaphoid links the proximal and distal carpal rows, a high shear force is likely placed on the RS arthrodesis site, with routine motion of the wrist. After DSE, there may be reduced stress on the RS fusion site, resulting in a better fusion rate. The authors found a significantly higher radial deviation in the RSL arthrodesis + DSE cohort but no difference between the other outcomes measurements, ie, ROM measurements and progression to wrist arthrodesis.

More recently, Biswas et al⁷ described their surgical technique for RSL arthrodesis and DSE using 2 headless compression screws. The authors reviewed the results of 9 patients, with a mean follow-up duration of 1 year, at which point all 9 patients exhibited radiographic union. Similarly, Quadlbauer et al³² described a series of 14 patients who underwent RSL arthrodesis + DSE after a malunited distal radius fracture. In this cohort, the wrist was approached through a pre-existing volar incision, and fixation was performed using a plate-and-screw construct. At 5 years of follow-up, a significant improvement was seen in ROM (flexion or extension

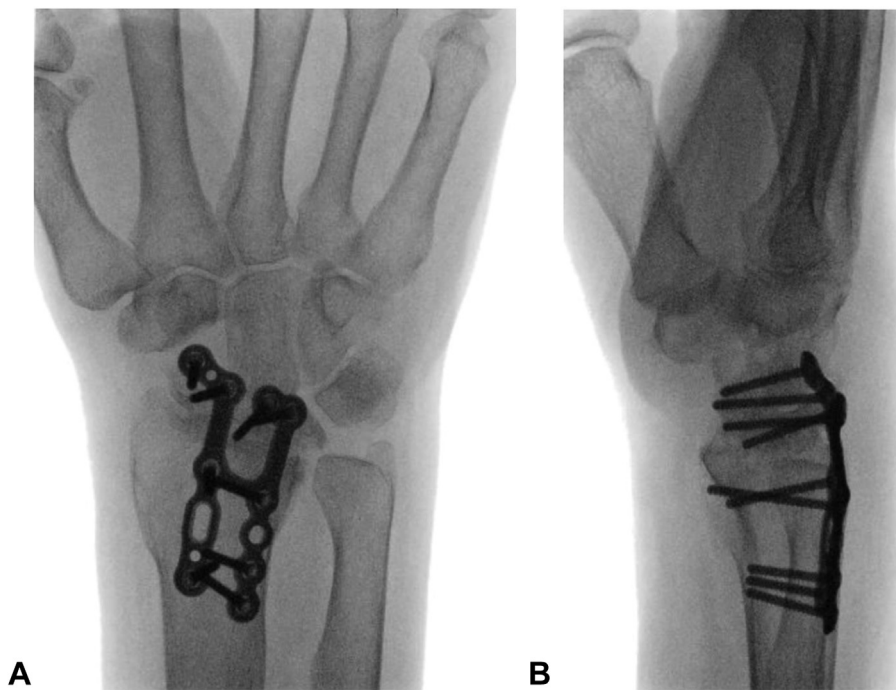


FIGURE 5: Final intraoperative, fluoroscopic images depicting the use of an RSL arthrodesis plate. **A** Anteroposterior view. **B** Lateral view. The distal pole of the scaphoid was excised.

arc, 95°; radial or ulnar deviation, 35°) and grip strength after the surgery. No midcarpal arthritis was noted on a computed tomography scan of the wrist at the final follow-up.

However, it must be noted that increased ROM due to DSE may alter the biomechanics of the remaining the carpal joints. Holleran et al²⁹ tested 8 cadaveric specimens using either simulated RSL arthrodesis or simulated RSL arthrodesis + DSE. They noted decreased ROM after RSL arthrodesis alone, which improved after DSE. However, the contact pressure at the lunatocapitate and STT joints also increased after RSL arthrodesis and RSL arthrodesis + DSE, which may be responsible for midcarpal arthritis.

RSL fusion with distal scaphoid and TE

Triquetrum excision is thought to further increase ROM, especially ulnar deviation, after RSL arthrodesis + DSE.^{5,11} In a cadaveric study of 10 specimens, the ROM of the intact wrist, simulated RSL arthrodesis, simulated RSL arthrodesis + DSE, and simulated RSL arthrodesis + DSE + TE was measured.³⁰ The authors demonstrated an initial decrease after simulated RSL arthrodesis and a subsequent increase with each excision after simulated RSL arthrodesis. The flexion and extension were noted to be 87% and 97% of normal, respectively, whereas the radial and ulnar deviations were found to

be 119% and 137% of normal, respectively, after RSL fusion + DSE + TE.

Another cadaveric study by Bain et al⁵ showed improvement in ROM after DSE and TE. The authors used 12 specimen and exhibited that after simulated RSL arthrodesis, DSE improved the flexion or extension ROM and radioulnar deviation ROM by 35% (ROM, 25°) and 34% (ROM, 11°), respectively. Further improvement was seen after TE, as the flexion or extension ROM increased by 13% (ROM, 13°) and radioulnar deviation ROM by 21% (ROM, 9°), respectively.

The only clinical study that examined patients who had undergone both DSE and TE was published by Ha et al.³³ They compared their results in patients who underwent RSL arthrodesis alone (4 patients), RSL arthrodesis + DSE (3 patients), and RSL arthrodesis + DSE + TE (8 patients), with a minimum of 10 years of follow-up. The authors reported an increase of 47% (22° vs 12°) in the ulnar deviation after DSE + TE compared with that after DSE alone.

Although Holleran et al²⁹ did not specifically study the effect on contact pressures in the remaining carpal joints after TE, it could be postulated that they would increase, as seen with RSL arthrodesis alone and RSL arthrodesis + DSE. Further clinical studies are warranted to evaluate the improvement in ROM and the development of midcarpal arthritis after TE.

PRINCIPLES OF RADIOCARPAL FUSION

The planned articulations between the future fusion mass and the remaining carpus joints should be confirmed as functional and pain-free before performing arthrodesis. This is not to say that the remainder of the wrist must be free of arthritic changes. For example, the presence of STT arthritis does not preclude RSL arthrodesis as long as the distal pole of the scaphoid is ultimately resected. The exposure of the wrist is commonly achieved through a dorsal approach taken through the third extensor compartment, and the second and fourth extensor compartments are elevated radially and ulnarly, respectively. Posterior interosseous nerve neurectomy may be performed before entering the wrist joint if this approach is used. The distal ulna may be addressed if symptoms arising in the distal radioulnar joint are present. In the setting of a concomitant Darrach procedure, the resected ulna can be used as an autologous bone graft, as has successfully been done by other authors.^{12,25,28} Alternatively, the graft may be obtained locally via corticotomy in the dorsal distal radius or excised distal pole scaphoid or triquetrum or remotely from the iliac crest. Bony preparation begins by debriding the cartilage surfaces within the planned fusion mass. Joint surface preparation may be accomplished through the use of a rongeur, curette, or conical reamer, which creates a “cone-and-cup” interface. The advantage of this interface is that the angle of the fusion mass can be altered as desired before fixation. Alternatively, a flat fusion interface may be created using a simple sagittal saw. With this interface, the position of the fusion mass is determined by the angulation of the cuts and may not be altered.³ The prepared surfaces are then opposed and interposed with adequate bone graft to promote bony fusion.

Various fixation options exist to stabilize the fusion mass. These include K-wires, headless compression screws, memory staples, locking plates designed specifically for RL or RSL arthrodesis, and dual-plate constructs.^{7,11,17,29,34,35}

Rodgers et al³⁵ compared traditional K-wire fixation with plate fixation for limited wrist fusion. The authors found no difference in pain relief, ROM, grip strength, pinch strength, or Disabilities of the Arm, Shoulder and Hand (quickdash) score between the 2 groups. However, 5 of 6 patients with K-wire returned to the operating room for wire removal, incurring an additional cost of \$1,975 per patient compared with that for the plate group. Other studies on 4-corner arthrodesis have demonstrated relatively

high rates of nonunion with plate fixation and increased rates of local complications such as impingement and neuritis.^{36–38} However, these studies preferentially used bone grafts from the excised scaphoid in their plate cohorts. Although there is no high-level evidence to indicate that the source of the bone graft has an effect on fusion rates, the study by Rodgers et al,³⁵ in which no patient with a plate and only 1 patient with K-wire fixation had a nonunion, controlled for the location of the bone graft, with all the patients receiving a graft from the distal radius.

Mavrogenis et al³⁹ assessed clinical and radiographic outcomes in 31 patients who underwent partial wrist arthrodesis performed using a variety of techniques, including K-wire fixation (14 patients), headless compression screws (8 patients), and circular plates (9 patients). After the surgery, 74% of the patients reported no pain, with an increase in wrist ROM and grip strength by 27% and 70%, respectively, compared with those in the unaffected wrist. Three patients experienced incomplete fusion, 2 of whom were treated with K-wire fixation. Circular plate fixation was associated with local complications such as complex regional pain syndrome and impingement.

Overall, the literature does not support 1 form of fixation as superior to another in terms of outcomes, although traditional K-wire fixation may necessitate planned return to the operating room for wire removal, thereby incurring extra cost. Plate fixation may be associated with increased incidence of local irritation requiring hardware removal. An unequivocally superior source of bone graft has not been established, but studies have shown that a locally sourced distal radius bone graft is adequate. Further research is needed to determine the ideal implant and source of bone graft for these radiocarpal arthrodesis.

Authors' preferred technique

The authors' preferred technique is similar to the one described by Stanley and Boot.⁴⁰ Fixation is achieved using the 2.5 TriLock RSL fusion plate (Medartis, Extion) for RSL arthrodesis. Exposure is achieved dorsally through the third extensor compartment, and the second and fourth dorsal compartments are elevated radially and ulnarly, respectively. Posterior interosseous nerve neurectomy is performed before entering the wrist joint. The scapholunate (SL) interval is exposed, and the articular cartilage from the proximal scaphoid and lunate, scapholunate interval, and the distal radius is removed down to cancellous

bone using rongeurs and curettes. One 1.6-mm (0.062 in) K-wire is used as a joystick in the distal scaphoid to reduce the SL interval, and another K-wire is used to secure the reduction. A bone graft taken from the distal radius, under Lister tubercle, is subsequently inserted into the SL and RSL articulations. The TriLock plate is contoured slightly and placed. Proximal screws are inserted to secure the plate to the distal radius, followed by 1 locking screw each in the scaphoid and lunate. The K-wire in the distal scaphoid is removed, and 1 additional locking screw each is placed in the scaphoid and lunate. Fluoroscopy is used to ensure no screw penetration into the midcarpal joint. Finally, a sagittal saw is used to resect the distal one-third of the scaphoid, and the defect is replaced with a rolled up piece of gelfoam. In cases in which the resulting motion of the midcarpal joint is deemed inadequate, the triquetrum is also resected. Hemostasis and closure are achieved in the usual fashion. The patient is immobilized in a volar, plaster orthosis initially and transitioned to a removable wrist orthosis at 2 weeks. Immobilization and a nonweight-bearing status are maintained for roughly 6–8 weeks until radiographic union is achieved.

Radiocarpal arthrodesis is a treatment option for advanced, symptomatic wrist arthritis affecting primarily the RL and/or radioscapoid articulations as a result of posttraumatic arthritis or RA. The exclusion of the midcarpal joint from the fusion allows the preservation of the dart-throwers motion, which is key to functional motion of the wrist. Some authors have reported a relatively high rate of nonunion after radiocarpal arthrodesis, but more recent series incorporating the distal pole scaphoid and/or TE as part of the arthrodesis procedure have demonstrated low rates of nonunion and moderate-to-high patient satisfaction. There is no evidence to support 1 form of fixation as clearly superior to another in terms of union rate or ultimate functional outcomes. Future research comparing radiocarpal arthrodesis with total wrist arthrodesis and total wrist arthroplasty in patients with relatively preserved midcarpal joints is needed to further assess the advantages and disadvantages of limited arthrodesis procedures for this patient population.

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JOURNAL CME QUESTIONS

Radiocarpal Fusion: Indications, Technique, and Modifications

1. Degenerative changes at which joint is a contraindication for radiocarpal rthrodesis?
 - a. Distal radiolulnar joint (DRUJ)
 - b. Lunocapitate joint
 - c. Radiolunate joint
 - d. Scaphotrapeziotrapezoid (STT) joint
2. Addition of triquetrum excision (TE) to radioscapulohumeral (RSL) arthrodesis with distal scaphoid excision (DSE) is felt to increase motion in which direction?
 - a. Circumduction
 - b. Ulnar deviation
 - c. Pronation
 - d. Supination
3. Prior to the introduction of disease modifying anti-rheumatic drugs (DMARDs), degenerative changes in the wrist were more common. In untreated rheumatoid arthritis, the carpus is most commonly found to be displaced in which direction?
 - a. Volar and ulnar
 - b. Volar and radial
 - c. Ulnar only
 - d. Radial only
4. Which of the following complications are seen in radiocarpal arthrodesis?
 - a. Nonunion
 - b. Stiffness
 - c. Flexor tendon rupture
 - d. a and b
 - e. All of the above

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