Basic Principle –
   Restore a pain free functional wrist range of motion

What is a functional range of motion?

Functional range of motion is the maximal angulation required to perform an activity. Results from 3 prominent studies demonstrated the flexion/extension (degrees) required for most ADLs to be:

10°/35° (Brumfield CORR 1984)
5°/30° (Palmer JHS 1985)
54°/60° (Ryu JHS 1991).

Common to these earlier studies were hygiene and occupational ADLs such as combing hair, dressing oneself, eating with utensils, or turning a doorknob. The motion used to accurately complete those tasks may be substantially different from the motion required for other activities not included in these earlier studies, such as talking on a mobile phone, typing on a computer keyboard, or using a computer mouse. The last is especially important as minor variations in accuracy and precision while using a computer mouse can have profound effects on overall function.


A different approach is to determine to what degree can the wrist perform tasks under restricted conditions?

This study assessing more than 125 ADLs demonstrated that even while using a custom-made splint to restrict wrist motion to “as close to zero as possible,” many activities can still be performed accurately.

The 7 most difficult activities to perform under highly restricted conditions included fastening a bra, dusting a low surface, washing
one’s back, writing one’s name, using a manual can-opener, handling a sharp knife, and using a manual egg-beater.

These activities are not equally relevant to all patients weighing their options between two functionally limiting procedures.

Nelson noted that “all ADLs are not equally important.” Thus, even the most comprehensive of studies had difficulty establishing a standard for functional wrist motion generalizable to all patients.


A prospective, randomized, crossover design randomized 42 men and women above 45 years of age with normal wrists to wear both a partially restricted and a highly restricted splint for 24 hours each.

Serving as their own controls, objective and subjective outcome measurements were taken at baseline and after each of the 2 splinting periods.

Measurements included range of motion parameters and subjective surveys:

Disabilities of the Arm, Shoulder, and Hand (DASH)

Patient Rated Wrist Evaluation (PRWE)

Modern Activity Subjective Survey (MASS)

Modern Activity Timed Test (MATT).

Results are listed as baseline, partially restricted, highly restricted:

flexion/extension arc of motion - 138°, 58°, and 20°

Median DASH scores increased from 1.8 to 14.4 and 20.8 (p <.01)

PRWE scores increased from 2.5 to 16.4 and 27.1

MASS results increased from 0.3 to 9.1 and 14.9
MATT results matched the perceived difficulty reflected by the subjective surveys, demonstrating significant increases in performance time for 6 of the 8 individual MATT items as well as significant differences for the sum of all tasks.

Conclusions
Use of low-profile splinting to restrict wrist motion demonstrates a direct correlation between restriction of wrist motion and functional disability.

**Wrist Contracture**

**Arthroscopic Contracture Release**

*Arthroscopic mobilization for contracture of the wrist.*
Hattori T et al. Arthroscopy. 2006

11 patients arthroscopic release intra articular adhesions
Capsular release – volar portal
Preoperative 76 degree arc of motion
Post operative average increase ROM of 22 degrees

**Traumatic/Degenerative Arthritis**

Treatment determined by location of arthritis within the wrist.

**Scapho trapezium trapezoid joint (STT)**

**Excisional arthroplasty**

*Trapezium excision – total:*

*Trapeziectomy and ligament reconstruction tendon interposition for isolated scaphotrapeziotrapezoid osteoarthritis of the wrist.*

15 patients mean followup 54 moinths
median pain intensity – 0
DASH score 16
Mayo wrist score 84
Partial trapezoid excision not needed.
Trapezium/trapezoid excision – hemi:

Results following trapeziometacarpal arthroplasty of the thumb.
Roberts RA1, Jabaley ME, Nick TG. J Hand Ther. 2001

retrospective follow-up study 25 hands in 23 patients,
7 hands with full trapezium resections
18 with hemi-trapezium resections.
median age was 60 years, with a range of 39 to 73 years
median follow-up period was 1 year 11 months, with a range of 3 months to 11 years
Grip and pinch strength were measured pre- and postoperatively. Pain
was assessed on a visual analog scale (VAS), and ADLs were
assessed by means of a 15-item survey. Both pain and ADLs were
evaluated postoperatively with recall of preoperative status.
all thumbs were immobilized in a static splint for 3 weeks and then
allowed progressive use.
Median improvements in hemi-trapezium resections included grip,
22.5 lb; pinch, 4.7 lb; and ADLs, 33%. Pain was reduced a median of
7.0 cm on the VAS.
Median improvements in full trapezium resection included grip, 29.5
lb; pinch, 0 lb; ADLs, 60%; and pain reduction, 8 cm on the VAS.

Distal scaphoid:

The effect of the dorsal intercarpal ligament on lunate extension
after distal scaphoid excision.
Kamal RN, Chehata A, Rainbow MJ, Llusá M, Garcia-Elias M. J
Hand Surg Am. 2012

After a distal scaphoid excision, most wrists develop a mild form of
carpal instability-nondissociative with dorsal intercalated segment
instability. Substantial dysfunctional malalignment is only occasionally
seen.
This study hypothesized that distal scaphoid excision would lead to
carpal instability-nondissociative with dorsal intercalated segment instability in cadavers and that the dorsal intercarpal (DIC) ligament plays a role in preventing such complications. 10 cadaver upper extremities studied
Five specimens had a distal scaphoid excision first, followed by excision of the DIC ligament
five specimens first had excision of the DIC ligament and then had a distal scaphoid excision.

RESULTS:
Distal scaphoid excision and subsequent DIC ligament excision both led to significant lunate extension. DIC ligament excision alone resulted in lunate flexion that was not statistically significant. After DIC ligament excision, distal scaphoid excision led to significant lunate extension.

CLINICAL RELEVANCE:
The development of a clinically symptomatic carpal instability-nondissociative with dorsal intercalated segment instability with lunocapitate subluxation after distal scaphoid excision may be due to an incompetent DIC ligament.

Arthrodesis – STT joint


Goals of reducing wrist pain, allowing a stable active wrist range of motion, and retarding degenerative changes make arthrodesis of the scapho-trapezio-trapezoid joint a popular treatment for chronic static and dynamic scapho-lunate instability; however, pitfalls and complications have not been well studied.
47 wrists in 46 patients over a 10-year period revealed a complication rate of 52%.
Failure to attain perfect scaphoid reduction consistently resulted in persistent incapacitating pain.
Radial styloid-scaphoid impingement, observed after "successful" limited wrist fusion, was effectively treated by simple styloidectomy.
Carpal osteomyelitis, lunate avascular necrosis, pin-tract infection,
progressive medial carpal translation, and intractable pain without arthrosis complete the spectrum of complications managed in this series. Careful preoperative patient screening and attention to detailed recommendations will assist surgeons in avoiding the many potential problems associated with this procedure.

Midcarpal arthritis
Arthrodesis
Capitate lunate

Scaphoid excision and capitolunate arthrodesis for radioscaphoid arthritis.
Kirschenbaum D1, Schneider LH, Kirkpatrick WH, Adams DC, Cody RP. J Hand Surg Am. 1993

18 with symptomatic radioscaphoid arthritis had scaphoid excision and capitolunate arthrodesis.
8 patients also had a silicone scaphoid replacement.
Follow-up period averaged 3 years.
Fusion was solid in 12 cases at an average of 8 weeks, and pain was significantly less at follow-up evaluation.
6 patients had a pseudarthrosis and five had persistent pain.
2 patients underwent successful repeat fusions
Wrist extension averaged 26 degrees, flexion 34 degrees, radial deviation 11 degrees, and ulnar deviation 24 degrees
Grip strength averaged 25 kg
Pin track infection and pseudarthrosis were the main complications.
Pain relief, functional motion, good strength, and patient satisfaction can be expected after scaphoid excision capitolunate arthrodesis.


This study compared the clinical outcomes of scaphoid and triquetral excision combined with capitolunate arthrodesis versus 4-corner
(capitate, hamate, lunate, triquetrum) intercarpal arthrodesis.

**METHODS:**
Retrospective review of 50 patients with scapholunate advanced collapse wrist changes who had 4-corner arthrodesis.
34 patients completed all follow-up evaluations.
Follow-up evaluation included radiographs, wrist range of motion (flexion-extension, radial-ulnar deviation, and pronation-supination); grip strength; visual analog scale (VAS); and Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire. Complications of nonunion, hardware migration, conversion to wrist arthrodesis or arthroplasty, and pisotriquetral arthritis were recorded.

**RESULTS:**
16 patients had capitolunate arthrodesis
18 patients had a 4-corner arthrodesis
There was no statistical difference in radial-ulnar deviation, pronation-supination, grip strength, VAS, or DASH scores between groups.
There was a slight increase in flexion-extension in the 4-corner group.
There were 2 nonunions in the 4-corner group and none in the capitolunate group.
5 patients in the capitolunate group required screw removal secondary to migration
3 patients in the 4-corner group required a subsequent pisiform excision.

**CONCLUSIONS:**
Capitolunate arthrodesis compares favorably to 4-corner arthrodesis at an average 3-year follow-up in this series

Scaphoid capitate lunate

**Scaphocapitolunate arthrodesis and radial styloidectomy for posttraumatic degenerative wrist disease.**

Study evaluated the clinical outcome of a radial styloidectomy and scaphocapitolunate (SCL) arthrodesis.
Retrospective review of 20 patients (average age 62 years, range: 27 to 75 years) treated from 1994 to 2010.
7 patients were treated for SNAC, 12 patients for SLAC wrists, and 1 for degenerative joint disease following a transscapho-transcapitate perilunate dislocation.
16 patients had Herbert screw fixation, and four had Spider plate fixation. All patients had autologous bone graft. Mean follow-up was 4.6 years (range: 2 to 9.6 years). Patients were evaluated clinically and radiographically. 19 of 20 arthrodeses healed on an average of 9.6 weeks. One patient was reoperated after 8 months to repair a nonunion of the SCL arthrodesis with a spider plate with an adequate result. The mean active flexion-extension arc was 70 degrees and the radioulnar deviation arc was 23 degrees. Pain decreased in all patients, 13 were pain free. The average postoperative DASH score was 24. Radiographically, neither radiolunate nor radioscaphoid arthritis was noted on follow-up. SCL arthrodesis with radial styloidectomy resulted in an adequate residual range of motion and pain relief.

**Radial Carpal Arthritis**

**Scaphoid excision with 4 corner fusion**

*Long-term results of midcarpal arthrodesis in the treatment of scaphoid nonunion advanced collapse (SNAC-Wrist) and scapholunate advanced collapse (SLAC-Wrist).*  

Outcome evaluation of midcarpal arthrodesis in the treatment of scaphoid nonunion advanced collapse (SNAC-wrist) and scapholunate advanced collapse (SLAC-wrist).  
**PURPOSE:** Scaphoid nonunion or scapholunate ligament instability results in carpal collapse and subsequent arthrosis. These conditions, termed SLAC-wrist and SNAC-wrist, are the most common patterns of arthrosis in the wrist. The purpose of this retrospective study was the evaluation of functional outcomes following midcarpal arthrodesis and of patients' satisfaction with these outcomes.  
**METHODS:** 49 patients mean follow-up time of 47 months.  
**RESULTS:** Postoperative AROM was 56% and grip strength was 76% compared with the contralateral side.
DASH score was 29 points
Pain relief was 34% at rest and 31% after stress
45 patients demonstrated bony consolidation in x-ray control
6 patients (12%) further required a total arthrodesis of the wrist

CONCLUSION:
Midcarpal arthrodesis is a reliable procedure for treating SLAC- and SNAC-wrists in stages II and III

2 column fusion

Lunatocapitate and triquetrohamate arthrodeses for degenerative arthritis of the wrist.

This study presented an arthrodesis technique involving the capitolunate and triquetrohamate joints as another potential treatment option.

METHODS:
From 2000 to 2009, 27 consecutive patients with degenerative scapholunate advanced collapse and scaphoid nonunion advanced collapse were evaluated prospectively and treated with scaphoid excision and intercarpal arthrodesis between the capitate and lunate and between the hamate and triquetrum.
This cohort consisted of 18 men and 9 women, involving dominant-sided surgery in 20 of 27 patients.
Two patients were active smokers, and 3 cases were work related.
Average age at time of surgery was 55 ± 3 years
Average follow-up was 51 ± 7 months
Preoperative and postoperative range of motion, grip strength, and radiographic evidence of osseous union were documented.
Standardized PRWE scores for both pain and function were collected.

RESULTS:
Wrist extension and flexion were decreased after surgery by 17% and 25% respectively, yielding a 21% decrease in mean flexion-extension arc
There was no significant difference with regard to postoperative radial and ulnar deviation
Compared to the contralateral side, preoperative and postoperative grip strength were 53% and 70%, respectively.
The average operative-sided grip strength increased by 27%.
The mean PRWE pain score was 11 ± 3 (of 50).
The mean PRWE functional score was 17 ± 5 (of 100).
Complications included 1 nonunion (yielding a 96% fusion rate), 1 median neuropathy (which resolved), and 2 superficial wound infections (treated successfully with oral antibiotics).

CONCLUSIONS:
Arthrodesis of the capitoluminate and triquetrohamate joints offers a motion-preserving strategy with a high union rate and good clinical function and pain outcomes for the treatment for scapholunate advanced collapse and scaphoid nonunion advanced collapse.

Bicolumnar intercarpal arthrodesis: minimum 2-year follow-up.
Draeger RW, Bynum DK Jr, Schaffer A, Patterson JM.
J Hand Surg Am. 2014

16 patients who underwent scaphoid excision and combined arthrodeses of the lunate-capitate and triquetrum-hamate joints (bicolumnar arthrodesis) from 2007 to 2010.
11 patients returned for follow-up evaluation
Outcome measurements included measurement of wrist flexion, extension, and grip strength, and completion of a patient-reported outcomes questionnaire, visual analog scale pain assessment, and DASH questionnaire.
Radiographs of each patient were reviewed for evidence of union.
Complications including nonunion and hardware migration were recorded.

RESULTS:
Wrist flexion-extension in the operative wrist was 68% of the contralateral control wrist.
Grip strength of the operative wrist was 97% of the contralateral wrist.
All 11 patients had radiographic bicolumnar union
8 patients had spontaneous radiographic fusion of the capitohamate joint.
One patient required capitoluminate screw removal for migration despite having evidence of union.

CONCLUSIONS:
Results from scaphoid excision and bicolumnar intercarpal arthrodesis are comparable to those reported for traditional scaphoid excision and 4-corner arthrodesis, with a similar loss of wrist range of motion and
with possible preservation of better grip strength in the operative wrist. Advantages of this modification include preservation of the normal lunate-triquetrum and capitate-hamate anatomic relationships and simplification of operative technique.

**Proximal Row Carpectomy (PRC)**

**Long-term outcomes of proximal row carpectomy: a systematic review of the literature.**

*Chim H, Moran SL. J Wrist Surg. 2012*

Systematic review of the English literature (MEDLINE search) to determine the best evidence on long-term outcomes following proximal row carpectomy.

192 studies were identified.

All studies with 10 or more years of follow-up were included in the review.

147 patients from six studies met the inclusion criteria and were included in the study.

The majority of patients were male and involved in manual labor.

There was no significant difference between the preoperative and long-term postoperative motion.

The weighted mean for postoperative grip strength was 68.4% compared with the contralateral side.

DASH, PRWE, and Mayo wrist scores were comparable to those reported for four-corner arthrodesis.

21 failures (14.3%) required re-operation. Failures were not associated with a specific preoperative diagnosis but distributed among patients with Kienböck disease, scaphoid nonunion advanced collapse, and scapholunate advanced collapse arthritis.

Conclusions This review confirms the long-term durability of proximal row carpectomy when used for the treatment of wrist arthritis. Although radiocapitate arthritis develops over time in most patients, the clinical significance of this finding is undetermined and does not necessarily correlate with failure of proximal row carpectomy. Poorer long-term outcomes are likely to result in patients engaged in heavy manual labor.

**Proximal Row Carpectomy: Minimum 20-Year Follow-Up**
Seventeen wrists in 16 patients, including 7 laborers
PRC for symptomatic DJD of the proximal carpal row
average age of 36 years Minimum Follow-up 20 yrs average 24 yrs
Radiographic and clinical evaluation
QuickDASH and PRWE for subjective assessment.
Results
Eleven wrists (65%) underwent no further surgery at a minimum 20-year follow-up.
Average time to failure of PRC, defined as the time from PRC to
radiocarpal arthrodesis, was 11 years (range, 8 mo to 20 y)
10 of 11 patients who did not undergo radiocarpal arthrodesis
continued to be satisfied, with minimal decrease in motion and grip
strength compared with the uninvolved side.
Average score for QuickDASH was 16 and PRWE was 26.
The flexion-extension arc was 68°, and grip strength was 72% of the
contralateral side.
All patients returned to their original employment.
There was no correlation between degenerative radiographic changes
and satisfaction level.
The predicted probability of failure revealed a higher risk in patients
who underwent PRC at a younger age, which leveled off at age 40
years.

**PRC vs 4 corner fusion**

**Proximal row carpectomy vs four corner fusion for scapholunate
(Slac) or scaphoid nonunion advanced collapse (Snac) wrists: a
systematic review of outcomes.**

*Mulford JS, Ceulemans LJ, Nam D, Axelrod TS. J Hand Surg Eur
Vol. 2009*

Proximal row carpectomy (PRC) and scaphoid excision with four-
corner fusion (4CF) are common motion-preserving, salvage
procedures for the treatment of wrists with scaphoid nonunion (SNAC)
or scapholunate advanced collapse (SLAC).
This study collated 52 articles that examine outcomes for SNAC or SLAC patients undergoing PRC or 4CF. Although the lack of unbiased trials must be acknowledged, this systematic review confirms that both procedures give improvements in pain and subjective outcome measures for patients with symptomatic and appropriately staged SLAC or SNAC wrists. PRC may provide better postoperative range of movement and lacks the potential complications specific to 4CF (nonunion, hardware issues and dorsal impingement). However, the risk of subsequent osteoarthritis is significantly higher in PRC patients despite the majority being asymptomatic at the time of review. Grip strength, pain relief and subjective outcomes are similar in both treatment groups.

**Motion-preserving procedures in the treatment of scapholunate advanced collapse wrist: proximal row carpectomy versus four-corner arthrodesis.**

*Wyrick JD, Stern PJ, Kiefhaber TR. J Hand Surg Am. 1995*

17 patients were treated with scaphoid excision and four-corner arthrodesis for SLAC wrist and followed for a mean of 27 months. 11 wrists in 10 patients had a proximal row carpectomy for SLAC wrist and followed for a mean of 37 months. The total arc of motion averaged:
- 95 degrees in the four-corner arthrodesis patients
- 115 degrees in the proximal row carpectomy patients
- 47% and 64%, respectively, of the ROM of the opposite wrist.

Grip strength averaged:
- 74% of the opposite wrist in the four-corner arthrodesis group
- 94% in the proximal row carpectomy group

3 wrists in the four-corner arthrodesis group failed and were successfully converted to a total wrist fusion; 2 additional patients were awaiting arthrodesis. There were no failures in the proximal row carpectomy group. Proximal row carpectomy showed a high degree of patient satisfaction and is our motion-preserving procedure of choice except in those wrists with advanced capitolunate arthritis.

Radial carpal arthritis
- Arthroplasty – total wrist replacement
Clinical outcomes of proximal row carpectomy versus four-corner arthrodesis for post-traumatic wrist arthropathy: A systematic review.

Systematic review of studies reporting clinical outcomes after proximal row carpectomy or to four-corner arthrodesis
7 studies (Levels I-III; 240 patients, 242 wrists) were evaluated. Significantly different post-operative values were as follows for four-corner arthrodesis versus proximal row carpectomy groups: wrist extension, 39 (SD 11°) versus 43 (SD 11°); wrist flexion, 32 (SD 10°) versus 36 (SD 11°); flexion-extension arc, 62 (SD 14°) versus 75 (SD 10°); radial deviation, 14 (SD 5°) versus 10 (SD 5°); hand grip strength as a percentage of contralateral side, 74% (SD 13) versus 67% (SD 16); overall complication rate, 29% versus 14%
The most common post-operative complications were:
  - non-union (grouped incidence, 7%) after four-corner arthrodesis
  - synovitis and clinically significant edema (3.1%) after proximal row carpectomy.
Four-corner arthrodesis gave significantly greater post-operative radial deviation and grip strength as a percentage of the opposite side.
Wrist flexion, extension, and the flexion-extension arc were better after proximal row carpectomy

Arthroplasty
  Hemiarthroplasty
  Proximal row carpectomy combined with wrist hemiarthroplasty.
A retrospective chart review was conducted for nonrheumatoid patients diagnosed with wrist arthritis and subsequently treated with wrist hemiarthroplasty combined with PRC
The minimum follow-up duration was 12 months
Preoperative and postoperative flexion, extension, and grip strength were recorded
Postoperative radiographic findings were assessed. PRWE questionnaire was administered to gauge postoperative pain and function.
10 patients were reviewed, mean age was 64 years
mean postoperative follow-up duration was 19 months
Postoperative flexion, extension, and grip strength were all found to be
less than the preoperative levels
Mean postoperative PRWE score for pain and function were 26 and
23
Complications were diverse and occurred at a relatively high rate.
PRC combined with distal radius hemiarthroplasty is a novel
procedure that offers a potential surgical option for the treatment of
wrist arthritis in select patients. Our early experience has lead us to
modify our technique with regard to the implant material, and at this
stage, the surgical technique and the most appropriate implant may
require further optimization.

Total Wrist Arthroplasty

Five to ten-year outcomes of the Universal total wrist arthroplasty
in patients with rheumatoid arthritis.

Study reports the prospective results of total wrist arthroplasty with use
of the Universal wrist prosthesis in a consecutive series of patients
with rheumatoid arthritis managed by a single surgeon.
24 wrist arthroplasties in 20 patients with rheumatoid arthritis were
followed prospectively.
19 wrists in 15 patients
mean followup of 7.3 years (range, 5.0 to 10.8 years)
Outcome measures included the DASH score, wrist range of motion,
and standard radiographic findings.
RESULTS:
Average DASH score improved from 62 points preoperatively to 40
Mean wrist flexion and extension at the time of the latest follow-up
were 42° and 20, for a mean improvement in the total flexion-
extension arc of 14°
A total of 9 wrists (45%) in 8 patients underwent revision surgery
because of a loose carpal component at the time of the latest follow-
up.
1 patient underwent wrist arthrodesis because of recurrent wrist
instability.
2 additional wrists in 2 patients had radiographic evidence of carpal
component subsidence at the time of the latest follow-up.
The implant survival rates at 5 and 7 years for the original prosthetic components were 75% and 60%

**CONCLUSIONS:**
The results for the Universal wrist prosthesis at a minimum of five years of follow-up include a high rate of failure, most often because of carpal component loosening, resulting in revision of ten (50%) of twenty wrists at the time of the latest follow-up (with the inclusion of one revision in a patient who died before five years). Patients with a stable prosthesis maintained a functional range of motion and had improvement in patient-reported outcome measures.

**Total wrist replacement: a retrospective comparative study.**

Purpose Total wrist arthroplasty (TWA) is an evolving procedure for the treatment of arthritis of the wrist joint. The purpose of this study is to compare outcomes of three different total wrist implants. Methods A retrospective review of the Biaxial, Universal 2, and Re-Motion total wrist arthroplasties was performed. Patients were evaluated for clinical outcome, radiographic analysis, review of complications (incidence and type), and conversion to wrist fusion. Patient function measures included: the Mayo wrist score, PRWE, and DASH score. Results:

46 wrist implants were performed in 39 patients
36 rheumatoid and 10 posttraumatic cases
Average follow-up was 6 years (3.5 to 15).
16 resectional arthroplasties (Biaxial)
30 resurfacing designs (Universal 2 and Re-Motion)
9 implant failures were noted
Causes for arthroplasty failure included distal component implant loosening and wrist instability
Salvage procedures included revision TWA or wrist fusion

In successful cases:
- flexion and extension motion averaged 30 and 38 degrees
- grip strength improved by 3 kg
- Mayo wrist scores increased from 40 (preoperative) to 76 (postoperative).
Mayo wrist scores for posttraumatic conditions averaged 87 points versus 71 points for rheumatoid arthritis.
Average DASH score:
  20 and 37 for the two resurfacing designs
  48 for the resectional arthroplasty design
Better results were correlated with improved distal component fixation and minimal resection of the distal radius.

Clinical outcomes of arthrodesis and arthroplasty for the treatment of posttraumatic wrist arthritis.


Stydt compared clinical outcomes of wrist arthrodesis and total wrist arthroplasty in the treatment of pancarpal posttraumatic arthritis.

Retrospective review of 22 patients
15 arthrodeses and 7 arthroplasties
clinical outcomes evaluated with the visual analog pain scale; DASH questionnaire; PRWE; and a study-specific questionnaire.
Postoperative complications were recorded from chart review.

RESULTS:
Mean follow-up:
68 months for arthrodesis
56 months for arthroplasty
Mean visual analog scale pain score was 2 for each group.
Mean DASH score:
  38 for the arthrodesis group
  29 for the arthroplasty group
Mean Patient-Rated Wrist Evaluation;
  73 for the arthrodesis group
  31 for the arthroplasty group
Results from the study-specific questionnaire revealed that the majority of patients in both groups were satisfied.
Complication rates were similar in both groups.

CONCLUSIONS:
Total wrist arthroplasty as an alternative to arthrodesis for the treatment of pancarpal posttraumatic arthritis may offer improved functional outcomes.
Clinical outcomes of total wrist arthroplasty.

Study evaluated the short-term clinical outcomes and complications of the Maestro Total Wrist System.
Retrospective review of 23 total wrist prostheses implanted in 22 patients
Outcome evaluation by visual analog pain scale and Mayo wrist and DASH questionnaires, wrist motion, grip strength, radiographs, and complications.

RESULTS:
mean follow-up of 28 months (range, 4-55 mo)
DASH score and Mayo wrist score were 31 and 54
Mean pain scores improved from 8.0 to 2.2.
Mean wrist flexion-extension arc was 90°
Radiographs revealed no evidence of prosthetic loosening
Grip strength averaged 60% of the strength of the opposite hand
Complications occurred in 7 of 23 patients.

CONCLUSIONS:
Total wrist arthroplasty performed for pancarpal arthritis as an alternative to wrist arthrodesis can yield successful outcomes with low short-term failure rates.

Total wrist arthroplasty: A systematic review of the evidence from the last five years.

Review of evidence on total wrist replacement from the last 5 years.
Eight articles met a minimum set standard.
The results of 405 prostheses were available, including seven different manufacturers.
The mean follow up was 2.3-7.3 years with an average age of 52-63.
Rheumatoid arthritis was the indication in 42% of patients.
Motec demonstrated the best post-operative DASH scores.
Only Maestro achieved a defined functional range of motion post-operatively.
Universal 2 displayed the highest survival rates (100% at 3-5 years), Elos had the lowest (57% at 5 years)
Biaxial had the highest complication rates (68.7%)
Remotion had the lowest (11%)
Conclusions:
Wrist arthroplasty preserves some range of motion.
Functional scores improved and were maintained over the mid- to long-term.
Complication rates were higher than wrist fusion
The evidence does not support the widespread use of arthroplasty over arthrodesis, and careful patient selection is essential.

Arthrodesis
Radial scaphoid lunate

Radioscapholunate arthrodesis - a prospective study.

RSL fusion with excision of the distal pole of the scaphoid and the entire triquetrum prospective study
23 patients (14 males and nine females)
average age of 47 (range 26-73) years
RSL fusion for post-traumatic osteoarthritis, rheumatoid arthritis and Kienböck's disease of the lunate
mean follow-up of 32 (range 13-70) months.
The absolute prerequisite for any of these groups of patients was a functional midcarpal joint which was assessed pre-operatively with radiographs and intra-operatively prior to RSL fusion.
average flexion to extension motion changed from 66 degrees to 57 degrees
ulnoradial range of motion also increased to 43 degrees from a pre-operative value of 22 degrees
visual analogue pain scores reduced from an average of 64 to 28 (p = 0.01)
19 patients had no restriction in activity and all but one was satisfied with the outcome.
All patients remained in full time employment with ten returning to some form of sport. RSL fusion with excision of the distal pole of the scaphoid and the entire triquetrum led to minimal reduction in the flexion-extension arc of motion and an increase in the ulnoradial arc. There was also good pain relief and maintenance of a patient's function. Memory staples are also an effective method of securing
fusion in the wrist obtaining similar results to that seen in forefoot surgery

Distal scaphoid excision after radioscaphoid arthrodesis.
McCombe D, Ireland DC, McNab I. J Hand Surg Am. 2001

Radioscaphoid and radioscapholunate arthrodeses are effective surgical procedures for the treatment of nonsalvageable and isolated radiocarpal arthritis. These procedures, however, limit wrist motion significantly as the immobile scaphoid bridges the remaining midcarpal joint. A cadaver study of radioscaphoid arthrodesis followed by distal scaphoid excision was undertaken. Range of motion after radioscaphoid K-wire fixation alone demonstrated a 58% decrease in the preoperative flexion-extension arc to 60 degrees. After distal scaphoid excision (with the radioscaphoid pins still in place) the flexion-extension arc increased to 122 degrees or 86% of the preoperative range of motion; most of the increase in motion occurred at the midcarpal joint. Distal scaphoid excision releases the midcarpal joint following radioscaphoid fixation and results in a significantly greater wrist motion. If the results of this cadaver study are extrapolated to clinical practice the addition of this step to the previously described procedures of radioscaphoid or radioscapholunate arthrodesis addresses their major limitation, restricted motion.

Results after radioscapholunate arthrodesis with or without resection of the distal scaphoid pole.

To evaluate the differences between radioscapholunate (RSL) arthrodesis alone versus RSL arthrodesis with additional distal scaphoidectomy.
**METHODS:**
61 patients treated with RSL arthrodesis for painful posttraumatic osteoarthritis – retrospective evaluation
Thirty patients had an RSL arthrodesis with additional resection of the
distal scaphoid pole (group A)
31 had RSL arthrodesis alone (group B).
Six patients in group A and 8 in group B had the RSL arthrodesis converted to a complete wrist arthrodesis during follow-up.
Those patients were excluded from the survey.
Of the remaining 47 patients, 35 (20 from group A, 15 from group B) returned for a clinical and radiological examination at an average of 28 (range, 10-47) months after the index surgery.
The results were rated by the DASH score and the modified Mayo Wrist Score.

RESULTS:
Group A 0 nonunions
Group B 3 radioscaphoid nonunions
No significant difference between groups A and B in the DASH score, the modified Mayo Wrist Score, grip strength, pain, or wrist motion. Radial deviation was then found to be significantly better in group A.

CONCLUSIONS:
Additional distal scaphoidectomy with RSL arthrodesis:
- improved postoperative radial deviation of the wrist.
- increase the successful fusion rate of RSL arthrodeses.
No significant effect on wrist extension, flexion, ulnar deviation, pain level, restriction in activities of daily living, or grip strength

Total wrist fusion

Health Status After Total Wrist Arthrodesis for Posttraumatic Arthritis
Lauren Adey, David Ring, Jesse B. Jupiter, 2005

Total wrist arthrodesis is regarded as the most predictable way to relieve the pain of posttraumatic wrist arthritis. Wrist arthrodesis also is believed to be compatible with a high level of upper-extremity function. This study evaluated the effect of total wrist arthrodesis on both general and upper-extremity–specific health status in patients treated for posttraumatic wrist arthritis.

22 patients evaluated an average of 6 years after total wrist arthrodesis for posttraumatic arthritis.

Upper-extremity–specific and general health status were measured
using DASH and Short-Form 36 (SF-36) instruments

Patient satisfaction and interest in pursuing a wrist-mobilizing procedure should one become available also were assessed.

Objective assessment included grip strength, digit range of motion, and radiographic fusion.

Results
Grip strength averaged 79% of the uninvolved wrist. The average DASH score was 25. The average physical component score of the Short-Form 36 was 39 and the average mental component score was 52. Fourteen patients complained of wrist pain, including severe pain in 4 patients. Fifteen patients were satisfied or very satisfied with the result of the fusion, 5 patients were neutral, and 2 patients were mildly dissatisfied. Twenty patients would elect to have a procedure that could make their wrist move again if one were available.

Conclusions
Substantial dysfunction was noted on both upper-extremity–specific and general health status measures after total wrist arthrodesis for posttraumatic conditions. Pain was improved but not eliminated.

References


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