



## Proximal row carpectomy : a motion-preserving procedure in the treatment of advanced Kienbock's disease

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Kienbock's disease is an isolated disorder of the lunate bone resulting from vascular compromise to the bone. In stage IV, degenerative changes are present at the midcarpal joint, the radiocarpal joint, or both. The goal of proximal row carpectomy (PRC) is the creation of a new joint between the capitate and the radius. The aim of this prospective study was to evaluate the functional outcome after PRC in late stage Kienbock's disease. The evaluation included assessment of range of motion, grip strength, and pain reduction.

Twelve wrists in 12 patients underwent proximal row carpectomy for the treatment of stage IV Kienbock's disease between 2002 and 2005. Objective and subjective function was assessed. The average length of follow-up was 2 years (range, 9 months to 4 years).

There was one failure (8.3%) requiring fusion at three years. The eleven wrists that did not fail (91.7%) had an average flexion-extension arc of 70°, associated with an average grip strength of 80% of the contralateral side ; all patients were very satisfied. The patients rated nine wrists as not painful, two as mildly painful, and one as moderately painful. Radiographs revealed reduced radiocapitate space in five and complete loss of the space in one. With the numbers available, there was no significant association between loss of joint space seen on radiographs and subjective and objective function.

Overall, proximal row carpectomy had maintained a satisfactory range of motion, grip strength, and pain relief, and all twelve patients with Kienbock's disease, except one, were satisfied with the results and returned to their previous occupations. Caution should be exercised in performing the procedure in a young, heavy manual working patient.

**Keywords :** Kienbock's disease ; proximal row carpectomy.

### INTRODUCTION

Kienbock's disease, or osteonecrosis of the lunate, may lead to chronic, debilitating wrist pain. Aetiologic factors include vascular and skeletal variations, combined with trauma or repetitive loading. Kienbock's disease most often occurs in the dominant hand of young men with a history of manual labour. In stage IV, degenerative changes are present at the midcarpal joint, the radiocarpal joint, or both. Treatment options include proximal row carpectomy (PRC) and wrist arthrodesis (1).

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Stamm (11) in 1944 described PRC as a method of restoring function to the wrist by converting it from a complex link system to a simple ball-and-socket joint. The goal of the operation is the creation of a new joint between the capitate and the radius

Proximal row carpectomy is a generally accepted motion-preserving surgical procedure for the treatment of advanced radiocarpal osteoarthritis (13, 15).

Criticism includes postoperative loss of grip strength, unsatisfactory range of motion, prolonged rehabilitation time, and the potential for progressive painful arthritis (5).

In symptomatic stage III Kienbock's disease, proximal row carpectomy may be considered not only as a secondary "salvage," but also a primary reconstructive procedure (9). When salvage is necessary, a PRC can be relatively easily converted to a wrist fusion (8).

Problems with implant failure and silicone synovitis following wrist joint replacement and a high complication rate in wrist arthrodesis have recently increased the interest in solutions that use residual biological articular surfaces. These include limited intercarpal fusions and proximal row carpectomy. The latter is a relatively easy procedure with reportedly few complications (7, 12).

### PATIENTS AND METHODS

The study involved 12 wrists in 12 patients who underwent proximal row carpectomy for the treatment of stage IV Kienbock's disease between 2002 and 2005. The median follow-up period was 2 years (range, 9 months to 4 years). Eleven patients were male; the average age was 30 years (range 20-40).

The evaluation consisted of a physical examination (range of wrist motion and grip strength), plain radiographs, and completion of a questionnaire that assessed patient satisfaction, return to work status, occupational and recreational activities and restrictions, and pain level.

#### Operative technique

The carpus is typically exposed through a dorsal longitudinal incision through the dorsal compartment. The lunate is excised first because it is usually the easiest. When possible, the triquetrum and scaphoid are then

sharply excised. If that is not possible, they can be excised piecemeal. Care should be taken to preserve the radiocarpal ligament to prevent postoperative ulnar translocation of the carpus. The dorsal wrist capsule is then repaired with sutures. The patient is immobilised postoperatively for three weeks in a short arm cast. Radiographs are obtained after two weeks to make sure the capitate is located in the lunate facet of the radius. The patient is placed in a removable splint and started on range-of-motion and strengthening exercises; activities are progressed as tolerated. Maximum strength may take 1 year or longer to achieve.

### RESULTS

There was one failure (8.3%) in a patient that had persistent pain and was not satisfied, requiring fusion after three years. It occurred in a patient who was 35 years at the time of the proximal row carpectomy and was working as a farmer. The 11 wrists that did not fail (91.7%) had an average flexion-extension arc of 70°, radial-ulnar deviation of 30°, associated with an average grip strength of 90% of that on the contralateral side. Those 11 patients (91.7%) were very satisfied with their outcome of functional performance and pain relief, and all returned to their preoperative occupation (graded as excellent and good results) (fig 1, 2). The patients rated nine wrists as not painful (excellent results, 75%), two as mildly painful (good results, 16.7%), and one as moderately painful (fair result, 8.3%) (table I). Radiographs revealed no loss of the radiocapitate space in six wrists (50%), reduced space in five (41.7%), and complete loss of the space in one wrist (8.3%). The presence of radiographic changes did not correlate with patient satisfaction or degree of wrist pain (table II).

### DISCUSSION

Proximal row carpectomy as a treatment of disorders of the radiocarpal joint remains controversial despite numerous reports documenting clinically successful outcomes (2, 3, 4, 6, 10, 12, 15, 16).

A review of previous studies of proximal row carpectomy showed results comparable with those of our study. In a study done by Nagelvoort *et al* (10) after proximal row carpectomy, 11 patients



**Fig. 1.** — This 22-year-old male patient presented with severe pain in his right wrist joint with restriction of its movement, and was diagnosed as grade IV Kienbock's disease. **(a)** preoperative anteroposterior and lateral views showing radiocarpal arthritis ; **(b)** postoperative radiograph showing the proximal position of the capitate bone after excision of the proximal carpal row ; **(c)** final follow-up radiograph showing good wrist alignment and articulation ; **(d)** photographs of the patient showing good clinical results regarding range of wrist motion.

were evaluated and found improvement in range of wrist motion and grip strength by a mean of 70% of the opposite wrist. In another study on 20 patients after proximal row carpectomy, Jebson *et al* (6) found that the average wrist range of motion was 63% and the average maximal grip strength was 83% of the opposite extremity, respectively. This is in agreement with our study as we got an average flexion-extension arc of 70°, associated with an average grip strength of 90% of the contralateral side ; similar results were achieved by Didonna *et al* (4) who reviewed 22 wrists after PRC. However in another study by Trankle *et al* (15) who reviewed 33 patients, flexion/extension was 70° but the grip strength was 54% of the unaffected side.

In our study, the presence of radiographic changes did not correlate with patient satisfaction or degree of wrist pain, in agreement with Jebson *et al* (6) and Didonna *et al* (4) who found that although degeneration of the radiocapitate joint was seen radiographically in 14 of the 17 wrists, it did not preclude a successful clinical result. Because of eventual radiocapitate arthrosis, we agree with Streich *et al* (13) who suggest PRC only in patients without significant degenerative changes at the proximal pole of the capitate or the lunate fossa.

In our study, there was one failure (8.3%), a patient that had persistent pain and was not satisfied and was managed by successful radiocarpal fusion. That patient was 35 years old at the time of



**Fig. 2.** — This 24-year-old female presented with severe wrist pain not responding to medical treatment, there was restriction of wrist movement and mild weakening in grip strength. **(a)** preoperative antero-posterior and lateral views showing radiocarpal and midcarpal arthritis ; **(b)** early postoperative radiograph showing the proximal position of the capitate bone after excision of the proximal row of carpal bones and immobilisation of the wrist ; **(c)** final follow-up radiograph showing good wrist alignment and articulation ; **(d)** photographs of the patient showing good range of wrist motion.

Table I. — Clinical results

Post-op. pain	R.O.M (flexion-extension arc)	Grip strength (% of contralateral side)	Grade	No. of cases
No pain	80 degrees	90%	Excellent	9 (75%)
Mild pain	60 degrees	70%	Good	2(16.7%)
Moderate pain	< 60 degrees	< 70%	Fair	1(8.3%)

Table II. — Relation of radiographic changes and clinical results

Radiographic changes	Post-op. patient satisfaction	Degree of pain	No. of cases
No loss of joint space	Satisfied	None or mild	6 (50%)
Reduced joint space	Satisfied	None or mild	5 (41.7%)
Complete loss of joint space	Not satisfied	Moderate	1 (8.3%)

PRC and was working in heavy manual job as a farmer. Similar results were achieved by Jebson *et al* (6) who noted two patients (10%) with persistent pain after PRC, requiring a radiocarpitate arthrodesis, Tomaino *et al* (14) also had one patient out of 23 wrists (4.3%) who required fusion because of failed PRC. On the other hand, in a study done by Steenwerckx *et al* (12) the failure rate was as high as 18.5%, however, those failures could be successfully converted into wrist arthrodesis.

In our study, the major complaint of pain was relieved following this technically easy surgery, a functional range of motion was obtained, the operation did not result in weakness and all but one of the patients resumed their preoperative occupations, so we believe that PRC is an acceptable alternative to wrist arthrodesis for stage IV disease if the patient is willing to risk having some residual pain to preserve wrist motion, and provided that there is no osteoarthritis over the capitate and the lunate facet preoperatively

Caution should be exercised in performing the procedure in a young, heavy manual working patient.

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