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# Mid term results of radial metaphyseal core decompression on Kienböck's disease

R. SEVIMLI[1], K. ERTEM[1], O. ASLANTÜRK[2], B. ARI[3]

[1]Orthopedic and Traumatology, Inonu Universty TOTM Medical Center, Malatya, Turkey
[2]Malatya Educational Research Hospital, Malatya, Turkey
[3]Adıyaman Universty Education Research Hospital, Adıyaman, Turkey

**Abstract. – OBJECTIVE: Kienböck's disease is a commonly seen posttraumatic avascular necrosis characterized by avascular necrosis of the lunate bone of the wrist which involves the dominant hand. In our study, we aimed to present midterm outcomes of 12 cases treated with radial metaphyseal core decompression.**

**PATIENTS AND METHODS: In our clinic, 12 patients who applied to our outpatient clinic with intractable pain despite at least six weeks of conservative treatment were previously diagnosed and evaluated as Kienböck's disease between the years 2006 and 2014. Patients at early stage received radial metaphyseal core decompression.**

**RESULTS: The patients were evaluated as postoperative grip strength, flexion-extension gap, ulnar-radial deviation gap, VAS, Quick DASH and MAYO wrist scoring and patient satisfaction.**

**CONCLUSIONS: We determined that interventions performed for Kienböck's disease cannot halt radiological progression. We are of the opinion that radial metaphyseal core decompression, aiming at increasing blood perfusion, improve early diagnosis and treatment of Kienböck's disease, increasing the patient satisfaction.**

*Key Words:*
Kienböck's disease, Metaphyseal core decompression, Lunate vascular necrosis.

## Introduction

Kienböck's disease[1] is an osteonecrosis of lunate bone which is one of the proximal row of carpal bones whose diagnosis and treatment are more complicated when compared with many orthopedic pathologies. The reason for the use of different words for the description of the disease arises from the inability to reveal the etiology precisely[2,3]. It is rarely seen, and its actual incidence is not known for sure[4].

The disease demonstrates a progressive course with an occult onset. Frequently the patients have a trauma history. The patients should be followed-up for long periods and, in the case of need, treatment should be re-planned based on these follow-up visits[5].

For staging, Lichtman and Degnan classification is used (Table I)[6]. Staging has an utmost importance in clinical progression, treatment (if indicated and applied) in the selection and prognosis of the surgical procedure.

In our study, we aimed to present outcomes of patients who were hospitalized in our service, operated with the diagnosis of Kienböck's disease, and treated with radial metaphyseal core decompression.

## Patients and Methods

### Patients

Sixty Kienböck's patients who were registered in our Department of Hand and Upper Extremity Surgery between the years 2006 and 2014 were evaluated retrospectively. Patients in stage 1 and 2 who had conservative treatments such as wrist immobilization with splints but pain did not relive and operated with radial metaphyseal core decompression.

Patients with stage 3A, 3B, and IV or treated with other operation techniques were excluded.

After exclusion of other patients, our study population consisted of 7 males (58.33%) and 5 female (41.66%) patients.

Occupational distribution of our patients at the time of diagnosis was as follows: housewives (33.3%, n=4), workers (16.6%, n=2), students (16.6%, n=2), civil servants (8.3%, n=1), farmers (16.6%, n=2) and retirees (8.3%, n=1).

Without discriminating between major and minor traumas, history, 8 patients (66.6%) had previously experienced atraumatic event, while in 4 patients (33.3%), history of trauma could not be elicited. Before treatment, the patients had complaints for an average of 26.81 (range, 1 to 60) months.

*Corresponding Author:* Reşit Sevimli, MD; e-mail: resitsevimli@hotmail.com

**Table I.** Lichtman classification in Kienböck's disease.

| Stage 1 | Normal x-ray, signal intensity changes on MRI |
|---|---|
| Stage 2 | Lunate sclerosis on plain x-ray; fracture lines may be present |
| Stage 3A | Collapse of the lunate articular surface with normal carpal alignment and height |
| Stage 3B | Collapse of the lunate articular surface with fixed scaphoid rotation, proximal capitate migration, loss of carpal height |
| Stage 4 | Lunate collapse along with radiocarpal or midcarpal arthritis |

During controls, the patients received Quick DASH, Mayo wrist and VAS scoring forms; their routine clinical examinations were performed and standard wrist radiograms were obtained. For the measurements of grip strength and range of motion, Jamar hydraulic hand dynamometer and goniometer were used, respectively. Digital images were recorded and at certain pre- and post-treatment periods radiological assessments were performed using computer-assisted PACS system.

### Surgical Technique

**Radial metaphyseal core decompression:** A lid-like opening measuring 2 × 0.5 cm was excised 2 cm over radius styloid in the bone cortex and distal metaphysis of the radius was curetted without extracting cancellous bone (Figure 1). Then, the elevated bone cortex was divided into small fragments and placed over curetted metaphyseal part. Subsequently, periosteum was repaired, subcutaneous layer and skin were closed. Short arm splint was applied after surgery. Patients discharged from hospital at the same day or the next day following surgery.

During postoperative 2 week of follow-up period, sutures of the patients was removed. At 3 week control, their splints were removed and physical therapy and rehabilitation program was initiated. At the midterm and at the end of the physical therapy protocol, the patients were re-evaluated in the outpatient clinic.

### Statistical Analysis

Statistical comparisons were analysed using the paired sampless *t*-test and the SPSS software package (SPSS Inc., Chicago, IL, USA). The level of significance was accepted at *p*-value less than 0.05.

## Results

Mean ages of the male, female patients, and the study population were 35.71 (range 18-54), 38.8 (range 21-66), and 37 (range 18-66) years, respectively.

Patients' right (n=7, 58.33%) and left (n=5, 41.66%) wrists were affected, while bilateral involvement was not seen. At the time of diagnosis, 5 (41.66%) stage 1 and 7 (58.33%) stage 2 patients were detected.

The median follow-up period of the patients was 27.58 months (range, 6-60 months). During postoperative periods as clinical findings flexion, extension, radial deviation, and ulnar deviations

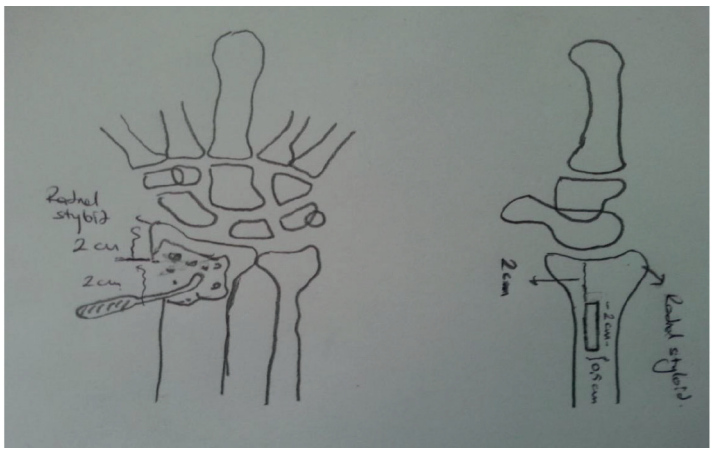


**Figure 1.** Figure of metaphyseal decompression mode.

**Figure 2.** Case of metaphyseal decompression.

ROMs, grip strength, DASH, Mayo wrist and VAS scores were examined. Radiographs and/or MRI were also obtained at final follow-up visit to determine stage of disease.

Median grip strength and ROM of wrist were statistically significant reduced when compraed with non-operated side (Table II). Median Quick DASH, Mayo wrist and VAS scores were 24.65 (range, 2.3-68.2), 68.75 (range, 35-95), and 3.41 (range, 0-6), respectively.

All patients but 2 had satisfactory results at final follow-up. Of the two patients with unsatisfactory result, one was at stage 2 and progressed to stage 4 after 3 years follow-up; it was treated with lunate exicion-tendon ball interpositon artroplasty with extensor carpi radialis longus (ECRL) were performed. The other one was 50-years old farmer with stage 2 disease at had still same pain but disease did not progress at final follow-up.

The disease was progressed only at 2 patients; one progressed from stage 2 to stage 4 in 3 years, the other progressed from stage 2 to stage 3A in 50 months.

After completion of the treatment stages 1 (n=5), 2 (n=5), 3A (n=1), and 4 (n=1), diseases were detected in respective number of patients

Any complication was not detected during operation and early postoperative periods.

## Discussion

Kienböck's disease was described more than a hundred year ago but treatment of Kienböck's disease is controversial, and different treatment techniques are recommended for different stages of disease[7-10]. In this article, we presented our clinical and functional results for early stage Kienböck's disease treated with radial metaphyseal decompression.

In early stages of Kienböck's disease, immobilization of wrist (with short arm cast or splint) for three months period is recommended as initial treatment[10,11]. Delaere et al[12] reported good results with immobilization equivalent to surgical treatment. Immobilization also could be accomplish

**Table II.** Comparison of the mean values of clinical parameters operated and non-operated side.

| | Operated side (range) (±SD) | Non-operated side (range) (±SD) | *p*-values |
|---|---|---|---|
| Flexion | 59.75° (45-72) (±8.62) | 75.41° (65-86) (±7.01) | 0.000 |
| Extension | 63.16° (48-72) (±6.89) | 75.58° (69-81) (±4.14) | 0.000 |
| Ulnar deviation | 27.83° (16-36) (±5.87) | 34.75° (26-39) (±3.5) | 0.000 |
| Radial deviation | 19.58° (10-25) (±4.85) | 25.91° (21-30) (±2.9) | 0.000 |
| Grip strength | 26.24 kg (11-36) (±6.99) | 32.96 kg (17.3-45.3) (±8.21) | 0.021 |

with external fixator or intercarpal pinning[13]. In another paper, it is reported the -surgical treatment failed in most of patients[14]. In our series, all patients had at least 3 months period of immobilization with cast or splint, we did not used surgical immobilization techniques.

When conservative surgical immobilization does not relieve symptoms, surgical interventions are indicated[8,13]. In the early stages of Kienböck's disease, aims of surgical interventions are unload, decompression, or revascularization of lunate[8-11,13-15]. Radial and/or ulnar osteotomies, vascularized bone graft, capitate shortening have been described for these aims[16-20].

For revascularization of lunate, metaphyseal decompression was described by Illarramendi et al[21] with good results. They developed this technique after spontaneous resolution of Kienböck's disease in a patient with non-displaced distal radius fracture. In this paper, they decompressed both distal radius and distal radius metaphysis. Two years later, Illarramendi and Carli[22] published a new article with more patients (48 patients). They showed increased radionuclide of carpal bones 3 months after radial metaphyseal decompression. They also reported that the addition of ulnar metaphyseal decompression to radial metaphyseal decompression had not been changed the results.

In their series, Illarramendi and Carli[22] reported satisfaction of 43 of 48 patients. Three patients with unsatisfactory results progressed to stage 4. They didn't report how many of patients with satisfactory results progressed to further stages[22]. In our series, 2 patients had unsatisfactory results and one of them progressed from stage 2 to stage 4. One of patients with satisfactory result progressed from stage 2 to stage 3A and didn't want additional interventions. None of patients showed regression in our series.

In their earlier publication, Illarramendi et al[21] reported 2 patient regressed from stage 3 to stage 2 in their earlier publication, conversely they did not recommend metaphyseal decompression for patients with stage 3A because they didn't have good results. They also reported that this procedure is contraindicated for stage 3B and stage 4. All patients we operated were stage 1 or 2 initially.

In both studies, Illarramendi et al[21] and Illarramendi and Carli[22] reported decreased wrist ROM and grip strength compared with non-affected side. In our investigation, we had similar results. All ROM of wrist decreased about 20-25% for non-affected side. Grip strength also decreased of 21% for non-affected side.

In a cadaveric study, Sherman et al[23] showed that radial metaphyseal decompression statistically decreased forearm stiffness, but did not altered loading forces of radial and ulnar fossas. But this study was unable to demonstrate affect of metaphyseal decompression on vascularization of lunate which was demonstrated by Illarramendi et al[21].

Limitations of our study are (1) retrospective design of study, (2) small number of patients, (3) relatively shorter follow-up period. But there are only 2 clinical study about radial decompression for treatment Kienböck's and they are also retrospective[20,21].

## Conclusions

The metaphyseal core decompression is a good option for treatment of Kienböck's disease. Technique is safe, relatively easy, and have no reported complications compared with other recommended techniques. Further studies, including multicentric, and prospective design with larger number of patients, should be conducted to investigate long-term clinical and functional results of metaphyseal core decompression.

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### Conflict of Interest

The Authors declare that they have no conflict of interest.

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