

Functional and clinical results of arthroscopic forage treatment in stage 1 Kienböck's patients

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ABSTRACT

Aim: To compare the functional and clinical results of early stage 1 Kienböck patients in whom we performed arthroscopic forage and synovectomy.

Methods: Adult patients who applied to Necmettin Erbakan University Meram Medical Faculty Orthopedics and Traumatology outpatient clinic between 01 June 2021 and 01 June 2022 were diagnosed with Kienböck stage 1 and were to be planned for arthroscopic forage treatment were included in the study. Patients who smoked, underwent other treatment protocols and received systemic steroid treatment were excluded from the study. Quick Arm Hand and Shoulder Problems (QuickDASH) questionnaire and visual analogue Pain Scale (VAS) score were applied to the patients before and at 3 months, 6 months, 9 months and 12 months after surgery. During the clinical examination, postoperative total joint range of motion (ROM) was measured and the normal side was examined. In addition, grip and pinch strength measurements were examined. Radiological criteria such as carpal height ratio, subchondral cyst and osteophyte formation were evaluated at each control.

Results: 22 patients applied to our clinic and 13 of them accepted the surgical procedure. 7 of these patients were men and 6 were women. Their average age was 27.8 years. The average follow-up period of these patients was 12 months. When the patients were examined after 12 months of follow-up, it was seen that the post-surgical vas score was significantly lower than the pre-surgical vas score ($p<0.001$). QuickDASH score and passive wrist movements improved significantly at postoperative follow-up. Grip strength increased significantly. Lichtman staging remained the same in 85% of patients.

Conclusions: In stage 1 Kienböck patients, arthroscopic forage and wrist synovectomy are performed, minimizing the functional losses of the patients and providing a rapid decrease in pain levels. As a consequence, patients return to social and business life early and with minimal loss.

Key words: Arthroscopy, Kienböck's disease, lunate bone, osteonecrosis, forage.

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Introduction

Kienböck disease is avascular necrosis of the lunate bone that can lead to progressive wrist

pain and carpal instability [1, 2]. It occurs mostly on the dominant wrists of men who do manual labor, between the ages of 15 and 40. If left untreated, the disease usually causes height loss in the proximal carpal bones, deterioration of wrist biomechanics, and progressive arthrotic changes in the proximal carpal region, following the disintegration of the lunate. The first symptom of the disease is intermittent wrist pain,

often in the dorsal part of the wrist, especially aggravated by extension movement. Classification of the disease is of great importance because the disease is a spectrum and there are different treatment options at each stage [3]. Lichtman classification is the most commonly used classification method and classifies according to radiography and MRI findings [4].

The size of the lunate and its distal articular facet are factors that affect the load-bearing capacity of the lunate at the wrist. In the study conducted by Camus et al., the height, diameter, distal facet width and slope of the lunate were evaluated on standard wrist anteroposterior radiographs in the control group and Kienböck's patients. They reported that lunatums were small in size, that is, small in diameter or height, were more likely to carry the risk of avascular necrosis with repetitive microtrauma. Although intraosseous pressure increases with increasing radial slopes, there is no correlation between lunate slope and Kienböck's disease [5].

Although the etiology of avascular necrosis in the lunate is still not fully elucidated, the most widely accepted theory is the deterioration of the vascular structure of the lunate due to repeated microtraumas and the resulting development of avascular necrosis [6-8]. Microfractures in the subchondral region become irregular and lead to articular deterioration in the future. Synovitis develops and then necrosis progresses to degenerative arthritis [9, 10].

There has not been a clear consensus on the treatment and management of Kienböck's disease for years. However, in general, the aim of the treatment of Kienböck disease is to reduce pain, preserve wrist biomechanics, prevent the progressive degenerative process and provide the patient with a functional wrist. Staging is an important step in treatment management due to the wide spectrum of the disease, which starts

with minimal changes and progresses to progressive wrist collapse and degeneration [11, 12]. Conservative treatment can be applied as the first option in patients diagnosed with Kienböck disease in stage 1. Treatment is planned with immobilization for 3 months and the use of nonsteroidal anti-inflammatory drugs. Patients who do not benefit from treatment require surgical procedures. Long-term immobilization treatment in Kienböck disease was described [13]. In the literature, there is a found rate of wrist arthrosis in 82.0% of 46 conservatively followed-up patients with a minimum follow-up of 5 years, but they stated that only 25.0% of the patients had serious pain complaints [13, 14].

The objective of this study is to compare the functional and clinical results of early stage 1 Kienböck patients in whom we performed arthroscopic forage and syneviectomy.

Materials and methods

Adult patients who applied to Necmettin Erbakan University Meram Medical Faculty Orthopedics and Traumatology outpatient clinic between 01 June 2021 and 01 June 2022 were diagnosed with Kienböck stage 1 and were to be planned for arthroscopic forage treatment were included in the study. Consent was obtained or waived by all participants in this study. The study was conducted in accordance with the Declaration of Helsinki and approved by the Committee of Ethics of Necmettin Erbakan University, Faculty of Medicine (Date: 2023. Project No: 211718003).

Patients who smoked, underwent other treatment protocols and received systemic steroid treatment were excluded from the study. Quick Arm Hand and Shoulder Problems (QuickDASH) questionnaire and visual analogue Pain Scale (VAS) score were applied to the patients before and at 3 months, 6 months, 9 months and 12 months after surgery. During the

clinical examination, postoperative total joint range of motion (ROM) was measured and the normal side was examined. In addition, grip and pinch strength measurements were examined. Radiological criteria such as carpal height ratio, subchondral cyst and osteophyte formation were evaluated at each control.

All patients were operated on by the same surgical team in the supine position under interscalene block or hypotensive general anesthesia. All patients underwent standard wrist joint arthroscopy. During arthroscopy, lunate forage was performed and dorsal synovectomy and excision of lunate connections from the dorsal capsule were performed (**Figure 1**).

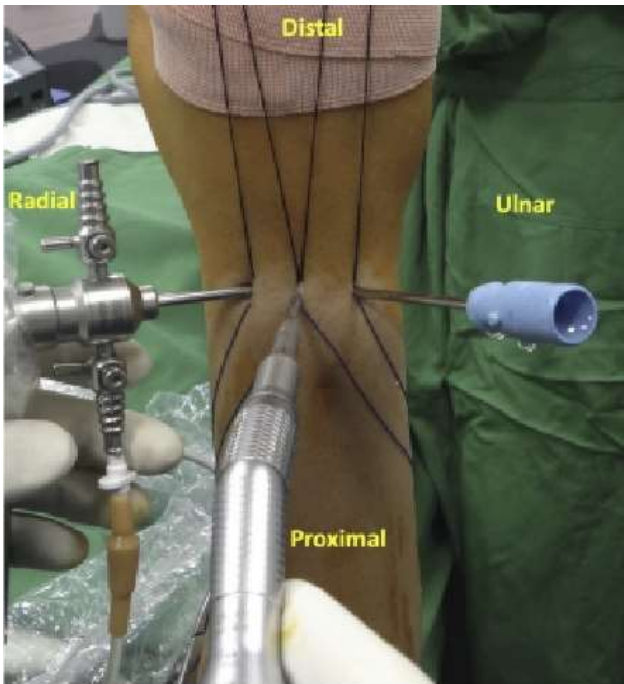


Figure 1. Arthroscopic forage intraoperative image.

All patients underwent a standard postoperative rehabilitation program. It was kept in a short arm splint for 3 weeks postoperatively. Passive exercises were started after the 3rd week. After the 6th week, active exercises were applied. Strengthening exercises were applied after the 9th week.

Statistical analysis: Statistical analyzes were performed with the Statistics for Social Sciences

(SPSS) v.18 package program. As descriptive statistics, arithmetic mean±standard deviation and median (minimum, maximum) were used to summarize numerical data, and numbers and percentages were used to summarize categorical data. The relationship between categorical data was analyzed with the Chi-square (χ^2) test. P values below 0.05 were considered statistically significant.

Results

There were 13 patients included in the study. While 54% of the patients were male, 46% were female. The average age of the patients was 27.8 ± 1.5 (22-49) years. The average follow-up period of the patients was 12.0 ± 2.0 months. Patients who underwent arthroscopic forage were evaluated according to pre- and postoperative VAS scores, QuickDASH scores, range of motion (ROM) and radiological criteria. The demographic characteristics of the patients are summarized in table 1.

Table 1. Demographic characteristics of the patients.

Parameters	Arthroscopic forage
Number of patients	13
Gender M/F (%)	7/6 (54%/46%)
Age (Mean ± SD)	27.8 ± 1.5 (22-49)
Follow-up time (Mean ±SD)	12.0 ± 2.0

When the postoperative VAS score of the patients was compared with the preoperative VAS score, the postoperative VAS scores (3rd month, 6th month, 9th month, and 12th month of postoperative) were significantly lower ($p < 0.001$) (Table 2). When the patients' postoperative QuickDASH score was compared with the preoperative QuickDASH score, the postoperative QuickDASH score (3rd month, 6th month, 9th month, and 12th month of postoperative) was found to be significantly lower ($p < 0.05$) (Table 3).

Table 2. Comparison of preoperative and postoperative VAS scores.

Score	Preoperative	Postoperative 3rd month	Postoperative 6th month	Postoperative 9th month	Postoperative 12th month
VAS	6.7±0.97	4.1±0.80	3.4±0.77	2.9±1.1	2.3±0.70
P value	<0.94	<0.001	<0.001	<0.001	<0.001

Values: Mean±SD

Table 3. Comparison of preoperative and postoperative QuickDASH scores.

Score	Preoperative	Postoperative 3rd month	Postoperative 6th month	Postoperative 9th month	Postoperative 12th month
QuickDASH	61±13	42±15	33±11	26±11	17±15
P value	<0.10	<0.05	<0.05	<0.05	<0.05

Values: Mean±SD

When the patients' postoperative ROM was compared with preoperative ROM, there was a significant increase in their postoperative ROM ($p<0.05$).

There was no significant difference in the grip and pinch strength measurements of the patients before and after the operation ($p<0.65$).

There was no statistically significant difference between the radiological measurements of the patients evaluated on direct radiography before and after the operation ($p<0.10$).

Discussion

Kienböck's disease is a condition that progresses with avascular necrosis of the lunate and causes progressive pain and loss of function in the wrist joint. The most common factors in its etiology are negative ulnar variance, arterial ischemia, repetitive traumas, and heavy work where hands are used a lot [5, 15, 16]. Planning the treatment of Kienböck's disease depends on patient-related factors such as ulnar variance, the stage of the disease, the presence or absence of arthrosis findings, and the patient's age or expectations [16, 17].

Kienböck disease often occurs between the ages of 20 and 40. It is more common in men

(Male/Female = 2/1). The disease often occurs in the dominant wrist and in those who work with their hands [3, 18]. The age range of the patients in our study was between 22 and 49. The numbers of men and women were close to each other (Male/Female=7/6). The fact that this number is close may be due to our small number of patients.

Goemina et al. stated that negative ulnar variance is associated with the progression of the disease, and that positive ulnar variance and neutral ulnar variance may be significant factors in preventing Kienböck's disease and preventing the disease from occurring [19]. The carpal height ratio was defined by Youm to determine the collapse of the lunate. Its normal value is 0.54 [20, 21]. This value decreases as the lunate collapses. Since all patients included in our study were stage 1, their preoperative radiological measurements were normal. During the monthly follow-up, these measurements did not change except for 2 patients. The stage of only 2 patients changed to stage 2 at the end of the 12th month. While 13 patients were stage 1 preoperatively, 11 patients were stage 1 and 2 patients were stage 2 at the 12th month postoperatively.

Many etiological factors have been identified in Kienböck disease. One of these reasons is

trauma [5, 15, 22]. A case of scapholunate ligament injury and subsequent lunate necrosis following a fall on the wrist while the wrist was dorsiflexed was published by Jason Desmarais and Maximillian Soong. It was suggested that scapholunate ligament injury could cause malnutrition on the lunate bone [23].

In the study conducted by Afshar et al., they divided a total of 21 patients with negative ulnar variance into two groups, performed capitate shortening surgery on 9 patients and radial shortening surgery on 12 patients, and compared the two groups with each other. There was no significant difference in grip strength, and short-term results reported that VAS and QuickDASH scores increased in both groups [24]. However, there was no study in which preop-postop VAS and QuickDASH scores were followed in stage 1 Kienböck patients by performing arthroscopic forage and synovectomy was not seen in the literature. In our study, preoperative and postoperative VAS and QuickDASH scores of the patients were examined. In the postoperative scoring evaluation, a significant decrease was observed in the patients' VAS and QuickDASH scores. We think that our study will contribute to the literature in this respect.

Takahara et al. showed that there was an increase in the postoperative ROM of patients in whom they performed radial osteotomy and plating [25]. In our study, it was observed that the postoperative ROM of the patients also increased as a result of arthroscopic forage. When looking at the literature, while ROM is evaluated after different surgeries, studies evaluating ROM after arthroscopic forage and synovectomy are limited. In our study, when the patients' hand grip strength and pinch strength measurements were evaluated, there was no significant difference between the preoperative and postoperative periods. The fact that the patient group was stage 1 may have been a factor in this.

Our study has some limitations. The limitations of the study are that it is retrospective and the sample size is small. However, our study is valuable in terms of the fact that little work has been done on this subject in Turkey and it supports future studies.

Conclusions

There isn't any study in which preop-postop VAS and QuickDASH scores were followed in stage 1 Kienböck patients by performing arthroscopic forage and synovectomy in the literature. In the stage 1 Kienböck patients, arthroscopic forage and wrist synovectomy are performed, minimizing the functional losses of the patients and providing a rapid decrease in pain levels. As a result, patients return to social and business life early and with minimal loss. Our study needs to be supported by studies with large patient participation.

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