International Journal of Research in Orthopaedics
Kumar A et al. Int J Res Orthop. 2026 Mar;12(2):391-394
http://www.ijoro.org

Original Research Article

DOI: https://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20260504

Evaluation of clinico-radiological outcomes in the treatment of Lichtman stage upto IIIa Kienböck's disease by radius core decompression

Akshay Kumar*, Narender Saini, Vikas Singh, Banisikha Das, Anil K. Badgotya

Department of Orthopaedics, SMS Medical College, Jaipur, Rajasthan, India

Received: 09 November 2025
Revised: 13 December 2025
Accepted: 20 January 2026

***Correspondence:**
Dr. Akshay Kumar,
E-mail: akshayjangra99@gmail.com

ABSTRACT

Background: Kienböck's disease is a progressive osteonecrosis of the lunate leading to chronic wrist pain and dysfunction. Radius core decompression (RCD) is a joint-preserving, minimally invasive procedure that aims to improve lunate perfusion by reducing intraosseous pressure. This study evaluates the clinico-radiological outcomes of RCD in patients with Lichtman stage I–IIIa disease.
Methods: A prospective observational study was conducted at the Department of Orthopaedics, SMS Medical College, Jaipur, including 32 patients with Lichtman stage I–IIIa Kienböck's disease. All patients underwent RCD and were followed for a mean of 16.7 months. Functional outcomes were assessed using the visual analogue scale (VAS), grip strength, and wrist range of motion. Radiological evaluation was done using the modified carpal height ratio (MCHR).
Results: The mean VAS score improved from 7.08 preoperatively to 3.31 postoperatively ($p<0.001$). Mean grip strength increased from 57.03% to 60.02% of the contralateral hand ($p<0.001$). There was significant improvement in wrist range of motion, including palmar flexion, dorsiflexion, and ulnar deviation. The mean MCHR stabilized postoperatively (1.55±0.016), indicating maintenance of carpal height. No cases progressed to advanced disease during follow-up.
Conclusions: Radius core decompression is a safe and effective joint-preserving technique for early-stage Kienböck's disease, providing significant pain relief, functional improvement, and stabilization of radiological parameters. It offers a viable alternative to more invasive revascularization or joint-leveling procedures in Lichtman stage I–IIIa disease.

Keywords: Kienböck's disease, Radius core decompression, Avascular necrosis, Lunate, Wrist function

INTRODUCTION

Kienböck's disease, or avascular necrosis of the lunate, is an uncommon disorder characterized by progressive bone ischemia and collapse. This condition, also known as avascular necrosis, results from a disruption in blood supply, leading to bone tissue death, fragmentation, and collapse of the lunate.[1]

The exact cause of Kienböck's disease remains unclear, but it is thought to arise from various risk factors associated with the lunate and wrist.[2] Its multifactorial etiology includes vascular insufficiency, repetitive trauma, and biomechanical stress due to anatomical variations such as negative ulnar variance.[3]

Traditional treatments aim at unloading the lunate or restoring blood supply through osteotomies or vascularized grafts. Radius core decompression (RCD) has recently emerged as a minimally invasive biological approach that stimulates regional hyperaemia and angiogenesis, enhancing lunate revascularization.[4] This study evaluates the clinicoradiological outcomes of RCD in patients with Lichtman stage I–IIIa Kienböck's disease

(Table 1).[6] Patients commonly experience wrist pain and tenderness over the lunate, along with reduced motion or stiffness, and possible swelling.

The disease is classified into stages based on clinical and radiological evaluations, which inform treatment options.[5]

Table 1: Lichtman classification for Kienbock's disease.[6]

Stages	Description
Stage I	Radiographically normal; diffuse signal changes on magnetic resonance imaging (MRI)
Stage II	Sclerosis of lunate
Stage IIIA	Lunate collapse with normal carpal alignment and height
Stage IIIB	Lunate collapse with fixed scaphoid rotation (ring sign), carpal height decreased, capitate migrates proximally
Stage IV	Severe Lunate collapse with degenerative changes at midcarpal joint, radiocarpal joint, or both

Treatment approaches for Kienböck's disease vary based on the clinical presentation and disease stage. Early intervention may involve observation or immobilization, while advanced stages often require surgical options such as joint levelling, lunate revascularization, limited carpal fusion, or total wrist fusion.[7,8]

Objective

The objective of this study to see the effect of RCD which is less invasive procedure on Kienbock stage up to IIIa through clinically and radiologically.

METHODS

This prospective observational study was conducted in the Department of Orthopaedics, SMS Medical College, Jaipur, India, between October 2023 and January 2025.

This study was designed to gather data on the clinical presentation, radiological progression and functional outcomes of patients diagnosed with early stage Kienbock disease who undergo radius core decompression as a mode of treatment.

Statistical analysis

The protocol was submitted to the institutional ethics committee for approval. After receiving approval, the study was initiated. Before including any patient in the study, voluntary written consent was obtained from either the patient or their legally acceptable representative.

Data collected were entered in Microsoft Excel Sheet by investigator himself on same day so as to minimize data entry bias if any. Statistical analysis was performed using IBM statistical package for the social sciences (SPSS) statistics.

All collected data were entered in an excel sheet. Quantitative data were expressed as mean±standard deviation (SD). Qualitative data were expressed as frequency and percentage. To compare the two related groups, the Wilcoxon signed-rank test for paired samples was applied to determine statistical significance. The confidence interval was set to 95%, and the margin of error was accepted at 5%. The $p \leq 0.05$ is considered as a significant and $p > 0.05$ would be considered insignificant.

Sample size

A sample size of 32 patients is calculated at 95% confidence interval and 10% absolute allowable error to verify expected 91% of patients would have good wrist flexion and mobility after 3 months post op period. This sample size could be enhanced to 35 cases considering 10% attrition and this sample size is adequate to cover all other study variable

Inclusion criteria

Inclusion criteria included patient with confirmed diagnosis of Kienbock and aged more than 18 years.

Exclusion criteria

Exclusion criteria included patient with associated wrist pathology, wrist fractures and skeletally immature patients.

Clinical assessments were performed preoperatively and at 6 weeks, 3 months, and 6 months postoperatively. Pain was measured using the visual analog scale (VAS), grip strength with a dynamometer, and wrist range of motion (ROM) using a goniometer. Radiological outcomes were evaluated by comparing the modified carpal height ratio (MCHR) from baseline to six months. Data were analysed using IBM SPSS v25, with statistical significance set at $p \leq 0.05$.

Surgical technique

Radius was approached through 3-4 cm longitudinal incision along radial border of distal radius metaphysis, 1 cm proximal to radial styloid. First dorsal extensor compartment tendons were retracted. Brachioradialis was incised in H shape and elevated. Bone window of 2×0.5 cm was made and cancellous bone was impacted without removing the bone. Post operatively below elbow slab was applied (Figures 1-3).

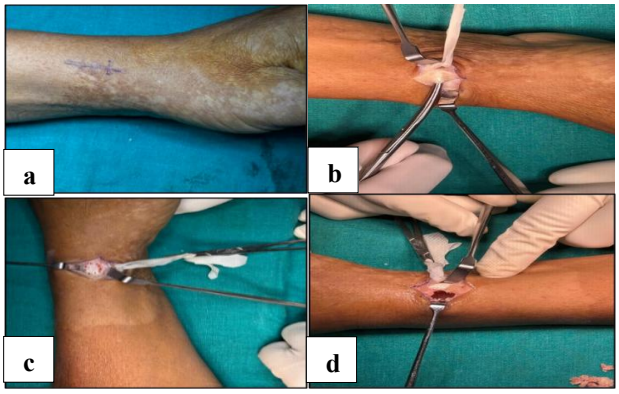

Figure 1: Radius core decompression surgical approach; (a) skin incision proximal to radial styloid, (b) first compartment tendons retracted and brachioradialis incised in H shape manner, (c) bone window was made using drill K wire, and (d) metaphyseal bone impacted against distal radius surface.

Figure 2: Preop X-ray and MRI film of 18 years/f with stage I Kienböck's disease right side. Preoperatively, range including radial deviation, ulnar deviation, dorsiflexion, palmar flexion.

Figure 3: (a) Immediate postop X-ray of wrist anterior-posterior and lateral views left side showing radius core decompression, and (b) at the final follow-up, the patient demonstrated improved range of motion radial deviation, ulnar deviation, dorsiflexion, palmar flexion.

RESULTS

Of the 32 patients, 20 (62.5%) were female and 12 (37.5%) males, with a mean age of 34.8 years (Table 2). The right wrist was affected in 65.6% of cases. Lichtman stage II and IIIa were the most common presentations, comprising 43.7% and 46.8% of cases, respectively.

Table 2: Preoperative and postoperative results.

Variable	Preoperative (mean ±SD)	Postoperative (mean ±SD)	P value*
Dorsiflexion (°)	41.07±10.54	41.81±4.71	0.001
Palmar flexion (°)	38.93±10.27	43.31±4.78	0.001
Radial deviation (°)	12.29±2.66	12.78±4.34	0.001
Ulnar deviation (°)	22.96±5.27	24.25±4.93	0.001
VAS score	7.08±0.75	3.31±5.08	0.001
Grip strength (mmHg)	57.03±6.69	60.02±4.68	0.001

Pain levels demonstrated significant improvement: mean VAS scores decreased from 7.08 preoperatively to 3.31 postoperatively ($p<0.001$). Grip strength improved from 57.03% to 60.02% of the contralateral hand ($p<0.001$). Mean wrist ROM increased across all planes—palmar flexion from 38.9° to 43.3°, dorsiflexion from 41.0° to 41.8°, radial deviation from 12.29 to 12.78 and ulnar deviation from 22.9° to 24.2° (all $p<0.001$). The mean postoperative MCHR was 1.50±0.016, indicating no improvement in carpal collapse. Post-operative complication in form of Transient superficial radial nerve palsy was seen in 3 patients which recovered in 6-8 weeks and none progressed to advanced Lichtman stages during follow-up (Table 3).

Table 3: Demographic details of the patients (n=32).

Variables	Category	Frequency	%
Sex	Male	12	37.5
	Female	20	62.5
Side affected	Right	21	65.63
	Left	11	34.37
Age (years)	<20	2	6.25
	21-30	5	15.62
	>30	25	78.3
Stage	Kienbock I	3	9.3
	Kienbock II	14	43.7
	Kienbock IIIa	15	46.8

DISCUSSION

The current study demonstrates that radius core decompression provides significant symptomatic and functional improvement in early-stage Kienböck's disease.

These findings align with prior studies by De Carli et al and Schulz et al, which reported sustained pain relief and improved wrist function following RCD.[9,10] The improvement in VAS and grip strength observed in our study supports the biological rationale that metaphyseal decompression enhances vascular perfusion by inducing a controlled bone-healing response. Our results further corroborate with Schiltenwolf et al biomechanical studies showing that decompression lowers intraosseous pressure and promotes revascularization within the lunate.[11]

Compared with traditional joint-levelling procedures such as radial shortening or ulnar lengthening osteotomy, RCD offers the advantage of being extra-articular, less invasive, and technically straightforward. This approach avoids altering wrist biomechanics and preserves bone stock for potential future interventions. While direct revascularization techniques using vascularized bone grafts have shown efficacy, they are technically demanding and associated with donor-site morbidity. Hence, RCD represents a biologically favourable and reproducible alternative for Lichtman stage I–IIIa disease.

Limitations

The limitations of this study include its relatively small sample size, single-centre design, and short-term follow-up. Long-term radiological assessment, including MRI-based revascularization markers, would provide a more comprehensive understanding of disease progression and durability of clinical outcomes.

CONCLUSION

RCD is a safe, minimally invasive, and effective joint-preserving procedure for early-stage (Lichtman I–IIIa) Kienböck's disease. It provides significant pain reduction, functional improvement, and maintenance of carpal architecture, with minimal complications. Early surgical intervention using RCD can prevent disease progression and delay or obviate the need for salvage wrist procedures.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Bain GI, Irisarri C. The etiology of Kienböck's disease. Kienböck's Disease. Adv Diagn Treat. 2016:65-88.
2. Bain GI, MacLean SB, Yeo CJ, Perilli E, Lichtman DM. The etiology andpathogenesis of Kienböck disease. J Wrist Surg. 2016;5(04):24854.
3. MacLean SB. Current Concepts in the Aetiology, Pathogenesis and Managementof Kienbock's Disease. PhD Thesis-University of Auckland. 2022.
4. Chojnowski K, Opiełka M Lutsky K, Beredjiklian PK. Kienböck disease. J Hand Surg Am. 201237(9):1942-52.
5. Stahl S, Hentschel PJ, Held M, Manoli T, Meisner C, Schaller HE, et al. Characteristic features and natural evolution of Kienböck's disease: five years' results of a prospective case series and retrospective case series of 106 patients. J Plastic Reconstruct Aesthet Surg. 2014;67(10):141526.
6. Allan CH, Joshi A, Lichtman DM. Kienbock's disease: diagnosis and treatment. J Am Acad Orthop Surg. 2001;9(2):128-36.
7. Piotrowski M, Mazurek T. Recent advances in assessment and treatment in Kienböck's disease. J Clin Med. 2022;11(3):664.
8. Camus EJ, Van Overstraeten L. Kienböck's disease in 2021. Orthop Traumatol Surg Res. 2022;108(1):103161.
9. De Carli P, Zaidenberg EE, Alfie V, Donndorff A, Boretto JG, Gallucci GL. Radius Core Decompression for Kienböck Disease Stage IIIA: Outcomes at 13 Years Follow-Up. J Hand Surg Am. 2017;42(9):752.e1-6.
10. schulz CU. Metaphyseal core decompression of the distal radius for early lunate necrosis. J Hand Surg Asian Pac Vol. 2019;24(3):276-82.
11. Schiltenwolf M, Martini AK, Mau HC, Eversheim S, Brocai DR, Jensen CH. Further investigations of the intraosseous pressure characteristics in necrotic lunates (Kienböck's disease). J Hand Surg Am. 1996;21(5):754-8.

Cite this article as: Kumar A, Saini N, Singh V, Das B, Badgotya AK. Evaluation of clinico-radiological outcomes in treatment of Lichtman stage upto IIIa Kienböck's disease by radius core decompression. Int J Res Orthop 2026;12:391-4.