How Do Hand Surgeons Treat Kienböck's Disease in Brazil? A Cross-Sectional Survey Study

Como os cirurgiões de mão tratam a doença de Kienböck no Brasil? Estudo transversal – Survey

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Abstract

Objective To analyze the therapeutic classifications and techniques used by residents and specialists in Hand Surgery in the treatment of Kienböck's disease in Brazil, considering the stage of the disease and the ulnar variance (UV) in young adults.

Methods Cross-sectional observational study, performed between August and October 2025, through an electronic questionnaire (Google Forms, Google LLC.) applied during events of the Brazilian Society of Hand Surgery (SBCM). Specialists and residents accredited by SBCM who agreed to participate and signed the Informed Consent Form were included. The instrument presented 10 standardized clinical cases, organized by the stages of the Lichtman classification and UV. The responses were analyzed descriptively, with a comparison between specialists and residents.

Results In total, 135 complete responses were obtained, 109 (80.7%) from specialists and 26 (19.3%) from residents. Most reported using the Lichtman classification (98.5%) and considering UV in decision-making (98.5%). Osteotomies predominated in the early stages (I and II). In the intermediate stages (IIIA and B), the techniques were heterogeneous, including osteotomy, vascularized bone graft, and proximal row carpectomy. In the advanced stages (IV), total wrist arthrodesis was the most indicated procedure (68.9%). Differences between specialists and residents were punctual.

Conclusion Therapeutic consensus was observed for stage II radial shortening osteotomy with negative UV, stage IIIB proximal row carpectomy, and stage IV total arthrodesis. In the remaining cases, there was no defined consensus. Differences between specialists and residents did not impact global trends.

Keywords
- hand/surgery
- Kienböck disease
- lunate bone
- treatment

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Resumo

Objetivo Analisar as classificações e condutas terapêuticas utilizadas por residentes e especialistas em cirurgia da mão no tratamento da doença de Kienböck no Brasil, considerando o estágio da doença e a variância ulnar (VU) em adultos jovens.

Métodos Estudo observacional transversal, realizado entre agosto e outubro de 2025, por meio de questionário eletrônico (Google Forms, Google LLC.) aplicado durante eventos da Sociedade Brasileira de Cirurgia da Mão (SBCM). Foram incluídos especialistas e residentes credenciados pela SBCM que concordaram em participar e assinaram o Termo de Consentimento Livre e Esclarecido. O instrumento apresentou 10 casos clínicos padronizados, conforme os estágios da classificação de Lichtman e variações de VU. As respostas foram analisadas descritivamente, com comparação entre especialistas e residentes.

Resultados Foram obtidas 135 respostas completas, sendo 109 (80,7%) de especialistas e 26 (19,3%) de residentes. A maioria relatou utilizar a classificação de Lichtman (98,5%) e considerar a VU na tomada de decisão (98,5%). As osteotomias predominaram nos estágios iniciais (I e II). Nos estágios intermediários (IIIA e B), as condutas foram heterogêneas, incluindo osteotomia, enxerto ósseo vascularizado e carpectomia da fileira proximal. Nos estágios avançados (IV), a artrodese total do punho foi a conduta mais indicada (68,9%). Diferenças entre especialistas e residentes foram pontuais.

Conclusão Observou-se consenso terapêutico para osteotomia de encurtamento radial no estágio II com VU negativa, carpectomia da fileira proximal no estágio IIIB e artrodese total no estágio IV. Nos demais, não houve consenso definido. Diferenças entre especialistas e residentes não impactaram as tendências globais.

Palavras-chave

- doença de Kienböck
- mão/cirurgia
- osso semilunar
- tratamento

Introduction

Kienböck's disease has a multifactorial etiology that has not yet been clarified. Initially, it was classified as osteomalacia and, later, as avascular necrosis of the semilunar bone.[1] It is a progressive pathology, characterized by hypoperfusion and structural deterioration of the semilunar bone.[2–4] The prevalence ranges from 0.0066 to 0.27%, with similar distribution between the sexes, predominantly in Caucasian individuals and in those subjected to repetitive microtrauma or mild trauma to the wrist, especially on the dominant side, with bilateral presentation being rare.[1,5–9]

The clinical presentation depends on the evolutionary stage, ranging from intermittent, poorly localized pain and central dorsal hand sensitivity to severe pain, limited mobility, significant functional impairment, and carpal instability, all of which compromise quality of life.[1,3,4,6,10] Early and accurate diagnosis has been increasing with advances in magnetic resonance imaging (MRI) and arthroscopy.[3,5–7,10–12]

The pathophysiological complexity contributes to the lack of therapeutic consensus, which is further aggravated by the predominance of recommendations based on individual clinical experience and patient preferences, given the scarcity of robust comparative studies.[1,5,11,13] Although there are therapeutic flowcharts based on a unified classification,[5,6,10] management remains challenging.

Previous studies in North America,[14,15] Europe,[13] and Finland used a methodology similar to that of the present study to evaluate the techniques adopted in each location. However, there are no national studies with this approach, justifying the need to evaluate the therapeutic plan for Kienböck disease in Brazil.

The primary objective of the study is to identify therapeutic differences in the treatment of Kienböck's disease among hand surgeons in Brazil at each stage. The secondary objective is to evaluate whether there are differences in treatment indications between Brazilian residents and specialists in hand surgery.

Methods

A cross-sectional observational study of the survey type was performed between August and October 2025, using Google Forms (Google LLC.) for the electronic questionnaire (►**Appendix 1**). The project was approved by the Research Ethics Committee (CAAE 90421325.3.0000.5487). Specialists in hand surgery and residents of services accredited by the Brazilian Society of Hand Surgery (SBCM) who had access to the questionnaire at the Society's scientific events were considered eligible.

Participants who did not agree to the informed consent form (ICF) or requested deletion of their data after completing the form were removed.

The questionnaire included ten standardized clinical scenarios of Kienböck disease, described as: "Young adult patient, male, right-handed, manual worker, with wrist pain for 6 months, without previous trauma or comorbidities".

Variations were determined by disease stage, according to the Lichtman classification, and by the associated radiological description. In each step, two options of ulnar variance (UV) were considered: neutral, positive (UV +) or negative (UV-).

For each case, therapeutic options included: immobilization, osteotomies, vascularized bone grafts, partial arthrodesis, lunate excision, proximal row carpectomy, total wrist arthrodesis, or open response, if the desired approach was not listed. Some responses required additional detail, such as specifying the immobilization time or the degree of shortening in radial osteotomy. The questionnaire also collected demographic information, training, time of professional experience, and region of activity.

The answer to all questions was mandatory, ensuring that only complete forms were analyzed. Responses were collected anonymously, and the platform performed the tabulation automatically.

The sample calculation assumed a finite population because the total number of SBCM members and residents is known (N = 1,011). A homogeneous proportion in the studied population (specialists: 80 vs. residents: 20), a 95% confidence level, and a maximum acceptable sampling error of 7% (d = 0.07) were considered, resulting in a minimum sample size of 112 participants.

Categorical variables were expressed as absolute and relative frequencies (n and %). Pearson's Chi-squared test was used to compare these variables between surgeons and residents.

Consensus was considered for the use of a given therapy at a given stage when at least 50% plus 1 of the participants selected the same technique.

Results

In total, 135 valid responses were obtained: 109 (80.7%) from hand surgery specialists and 26 (19.3%) from residents. The predominant geographic distribution was: Southeast, 71.1%; Northeast, 10.4%; and South, 10.4%. As for the time of experience, the most common category was less than 5 years of experience (34.8%) and between 5 and 10 years (20.7%). Complete results are shown in ►**Table 1**.

Most reported using the Lichtman classification to guide treatment (98.5%) and considering UV in therapeutic decision-making (98.5%). Furthermore, 23 participants (17.0%) reported the use of additional classifications, of which 21 (91.3%) employed the Bain & Begg classification. Treatment options ranged from conservative management to total arthrodesis (►**Table 2**).

In presentation 1 (stage I Kienböck's disease—UV-), the main options indicated were radial shortening osteotomy (40.0%), immobilization with splint/plaster cast (34.1%), and core decompression (16.3%). Among those who selected immobilization (n = 46), the most common durations were 6 weeks (60.9%) and 8 weeks (19.6%). Among those who chose the shortening osteotomy (n = 54), the preferred length was 2 mm (68.5%).

In presentation 2 (stage I—UV+ and neutral), the main options indicated were immobilization (35.6%) and core decompression (24.4%). Among those who opted for immobilization (n = 48), the preference was maintained for 6 weeks (54.2%) and 8 weeks (22.9%).

In presentation 3 (stage II—UV-), the main options indicated were radial shortening osteotomy (69.6%), core decompression (10.4%), and vascularized bone graft (5.9%). Among those who chose the shortening osteotomy (n = 94), the preferred length was 2 mm (67.0%).

In presentation 4 (stage II—UV+ and neutral), the main options indicated were core decompression (25.2%), capitate shortening osteotomy (24.4%), and vascularized bone graft (18.5%). Among those who opted for vascularized bone graft (n = 25), the most frequent options were vascular pedicle with bone graft from the 4th and 5th extracompartmental

Table 1 Demographic and professional distribution of participating surgeons

Demographic data		
	n	% of total
Specialty		
Hand surgeon specialist	109	80.7
Hand surgeon resident	26	19.3
Region		
North	3	2.2
Northeast	14	10.4
Midwest	6	4.4
Southeast	96	71.1
South	14	10.4
Years of experience		
< 5	37	27.4
5–10	28	20.7
11–20	24	17.8
21–30	22	16.3
31–40	11	8.1
> 41	3	2.2
Does the ulnar variance influence the treatment choice?		
Yes	133	98.5
No	2	1.5
Do you use the Lichtman classification to guide the treatment of Kienböck disease?		
Yes	133	98.5
No	2	1.5
Do you use other classification for the treatment of Kienböck disease?		
No	112	83.0
Yes	23	17.0
Bain & Begg	21	91.3*
Zapico	2	8.7*

Note: *Values refer to the proportion in the respective subgroup.

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Table 2 Detailed distribution of therapeutic approaches according to the stage of Kienböck's disease and ulnar variance

Responses										
	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10
Immobilization	46 (34.1%)	48 (35.6%)	2 (1.5%)	3 (2.2%)	–	–	–	–	–	–
Duration (weeks)										
4	5 (10.9%)	6 (12.5%)	–	–	–	–	–	–	–	–
6	28 (60.9%)	26 (54.2%)	1 (50.0%)	2 (66.7%)	–	–	–	–	–	–
8	9 (19.6%)	11 (22.9%)	1 (50.0%)	1 (33.3%)	–	–	–	–	–	–
12	4 (8.7%)	5 (10.4%)	–	–	–	–	–	–	–	–
16	–	–	–	–	–	–	–	–	–	–
> 16	–	–	–	–	–	–	–	–	–	–
Core decompression	22 (16.3%)	33 (24.4%)	14 (10.4%)	34 (25.2%)	6 (4.4%)	12 (8.9%)	1 (0.7%)	1 (0.7%)	1 (0.7%)	1 (0.7%)
Radio	22 (100%)	32 (97.0%)	14 (100%)	32 (94.1%)	6 (100%)	11 (91.7%)	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Radio e ulna	–	1 (3.0%)	–	2 (5.9%)	–	1 (8.3%)	–	–	–	–
Vascularized bone graft	1 (0.7%)	7 (5.2%)	8 (5.9%)	25 (18.5%)	18 (13.3%)	28 (20.7%)	1 (0.7%)	–	–	–
Technique										
Vascular pedicle from the 2nd intermetacarpal artery (Hori)	–	–	–	–	–	–	–	–	–	–
Dorsal capsule-based vascularized bone graft	–	–	–	2 (8.0%)	–	–	–	–	–	–
Vascular pedicle with bone graft from the 1st and 2nd intercompartmental arteries (Zaidemberg)	1 (100%)	3 (42.9%)	4 (50.0%)	8 (32.0%)	6 (33.3%)	5 (17.9%)	1 (100%)	–	–	–
Vascular pedicle with bone graft from the 4th and 5th extracompartmental arteries (Sheetz)	–	4 (57.1%)	3 (37.5%)	15 (60.0%)	9 (50.0%)	21 (75.0%)	–	–	–	–
Vascular pedicle with bone graft from the transverse volar carpal artery with cancellous bone	–	–	1 (12.5%)	–	2 (11.1%)	1 (3.6%)	–	–	–	–
Vascular pedicle with bone graft from the pisiform (bone ± articular cartilage)	–	–	–	–	–	–	–	–	–	–
Free vascularized graft	–	–	–	–	1 (5.6%)	1 (3.6%)	–	–	–	–

Table 2 (*Continued*)

Responses										
	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10
External fixation	–	–	–	–	–	–	–	–	–	–
Duration (weeks)										
4	–	–	–	–	–	–	–	–	–	–
8	–	–	–	–	–	–	–	–	–	–
Temporary fixation with K-wire (scaphotrapeziotrapezoid or scaphocapitate)	2 (1.5%)	7 (5.2%)	1 (0.7%)	6 (4.4%)	1 (0.7%)	2 (1.5%)	1 (0.7%)	1 (0.7%)	–	–
Radial shortening osteotomy	54 (40.0%)	3 (2.2%)	94 (69.6%)	4 (3.0%)	46 (34.1%)	5 (3.7%)	5 (3.7%)	–	–	–
Length, mm										
0– blade width	5 *(9.3%)*	1 *(33.3%)*	4 *(4.3%)*	–	1 *(2.2%)*	–	–	–	–	–
1	3 *(5.6%)*	1 *(33.3%)*	8 *(8.5%)*	1 *(25.0%)*	4 *(8.7%)*	1 *(20.0%)*	1 *(20.0%)*	–	–	–
2	37 *(68.5%)*	1 *(33.3%)*	63 *(67.0%)*	3 *(75.0%)*	29 *(63.0%)*	4 *(80.0%)*	3 *(60.0%)*	–	–	–
3	7 *(13.0%)*	–	15 *(16.0%)*	–	10 *(21.7%)*	–	1 *(20.0%)*	–	–	–
4	2 *(3.7%)*	–	4 *(4.3%)*	–	2 *(4.3%)*	–	–	–	–	–
Radial closing-wedge osteotomy	1 (0.7%)	6 (4.4%)	3 (2.2%)	13 (9.6%)	3 (2.2%)	8 (5.9%)	–	1 (0.7%)	–	–
Capitate shortening osteotomy	–	15 (11.1%)	2 (1.5%)	33 (24.4%)	–	10 (7.4%)	–	1 (0.7%)	–	–
Partial wrist arthrodesis	–	–	1 (0.7%)	2 (1.5%)	20 (14.8%)	25 (18.5%)	31 (23.0%)	30 (22.2%)	5 (3.7%)	6 (4.4%)
Structures										
Scaphocapitate	–	–	–	1 *(50.0%)*	13 *(65.0%)*	17 *(68.0%)*	23 *(74.2%)*	21 *(70.0%)*	4 *(80.0%)*	4 *(66.7%)*
STT	–	–	1 *(100%)*	1 *(50.0%)*	5 *(25.0%)*	6 *(24.0%)*	6 *(19.4%)*	7 *(23.3%)*	1 *(20.0%)*	1 *(16.7%)*
RSL	–	–	–	–	2 *(10.0%)*	2 *(8.0%)*	2 *(6.5%)*	2 *(6.7%)*	–	1 *(16.7%)*
Semilunar resection	–	–	–	1 (0.7%)	1 (0.7%)	3 (2.2%)	1 (0.7%)	2 (1.5%)	1 (0.7%)	1 (0.7%)
Without substitution	–	–	–	–	1 *(100%)*	3 *(100%)*	1 *(100%)*	2 *(100%)*	1 *(100%)*	1 *(100%)*
With substitution	–	–	–	1 *(100%)*	–	–	–	–	–	–
Proximal row carpectomy	–	–	–	–	30 (22.2%)	29 (21.5%)	82 (60.7%)	84 (62.2%)	24 (17.8%)	23 (17.0%)
Total wrist arthrodesis	–	–	–	–	–	–	6 (4.4%)	8 (5.9%)	93 (68.9%)	93 (68.9%)
Arthroscopy	6 (4.4%)	12 (8.9%)	6 (4.4%)	9 (6.7%)	7 (5.2%)	7 (5.2%)	6 (4.4%)	6 (4.4%)	7 (5.2%)	7 (5.2%)
Other	3 (2.2%)	7 (5.2%)	4 (3.0%)	5 (3.7%)	3 (2.2%)	6 (4.4%)	1 (0.7%)	1 (0.7%)	4 (3.0%)	4 (3.0%)

Abbreviations: RSL, radioscapholunate; STT, scaphotrapeziotrapezoid.
Note: Percentages refer to the proportion within the respective subgroup and not to the total sample.

arteries (Sheetz: 60.0%), and from the 1st and 2nd extracompartmental arteries (Zaidemberg: 32.0%)

In presentation 5 (stage IIIA), the main options indicated were radial shortening osteotomy (34.1%), proximal row carpectomy (22.2%), and partial wrist arthrodesis (14.8%). Among those who chose osteotomy, the preferred length was 2 mm (63.0%). Among partial wrist arthrodesis options (n = 20), the most commonly chosen was scaphocapitate (65.0%).

In presentation 6 (tage IIIA—UV+ and neutral), the main options indicated were proximal row carpectomy (21.5%), vascularized bone graft (20.7%), and partial wrist arthrodesis (18.5%). Among those who chose vascularized graft (n = 28), the Sheetz (75.0%) and Zaidemberg (17.9%) prevailed.

In presentation 7 (stage IIIb—UV-), the main options indicated were proximal row carpectomy (60.7%) and partial wrist arthrodesis (23.0%). When asked about structures for partial arthrodesis (n = 31), participants indicated the scaphocapitate (74.2%) and scaphotrapeziotrapezoid (STT: 19.4%) as the most common.

In presentation 8 (stage IIIb—UV+ and neutral), the main options indicated were proximal row carpectomy (62.2%), partial wrist arthrodesis (22.2%), and total wrist arthrodesis (5.9%). When asked about the structures involved in partial arthrodesis (n = 30), most participants selected scaphocapitate (70.0%) and STT (23.3%).

In presentations 9 and 10 (stage IV—both variance scenarios), total wrist arthrodesis was the most frequently indicated approach (68.9% in both cases). Proximal row carpectomy was the second most common option, with 24 indications (17.8%) and 23 (17.0%) in the respective presentations.

Considering consensus criteria as agreement greater than 50% of the participants, it was observed in stage II (UV-) for radial shortening osteotomy (69.6%), in stage IIIB for proximal row carpectomy (60.7 and 62.2%), and in stage IV for total wrist arthrodesis (68.9%). In the other scenarios, especially in stages IIIA and in presentations with UV+ and neutral, there was no consensus.

In the comparison of therapeutic techniques between specialists and residents (►**Table 3**), statistically significant differences were observed in Cases 3 ($p = 0.048$), 5 ($p = 0.045$), and 7 ($p = 0.042$). In these cases, although to a lesser extent, the residents maintained the main therapeutic choice adopted by the specialists (radial shortening osteotomy: cases 3 and 5; and proximal row carpectomy: case 7). However, there was a greater tendency among residents to report using arthroscopy. In the other scenarios, the therapeutic choices were homogeneous across specialists and residents ($p > 0.05$).

Discussion

The present study evaluated 135 specialists throughout Brazil, identifying high preference for the Lichtman classification (98.5%) and routine consideration of UV (98.5%) to guide the treatment of Kienböck's disease, as reported by Henry et al.,[2] Fontaine,[3] Lichtman et al.[10] and others.[1,5,8,14–16] Furthermore, 23 participants (17.0%) reported the use of additional classifications. Among these, 21 (91.3%) used the Bain and Begg arthroscopic classification, an option also presented as a secondary choice in Chojnowski et al.,[7] Tee et al.,[11] and Bain et al.[16] No participants mentioned Schmitt's classification, based on MRI, unlike Kolovich et al.[15]

The type of UV plays a significant role in treatment choice. This influence was especially evident in the early stages, in which wrists with UV- received greater indication for radial shortening osteotomy, as also reported by Lichtman and Pientka,[5] Chojnowski et al.[7] and Danoff et al.[14] In contrast, wrists with neutral or UV+ were subjected predominantly to immobilization treatments or capitate shortening osteotomy, as described by Camus and Van Overstraeten,[1] Fontaine,[3] Lichtman et al.[10] and others.[2,5,7,14]

In the stage-by-stage analysis, in stage I, radial shortening osteotomy was often selected as the initial treatment (40%), followed by immobilization (34.1%), usually for 6 weeks (60.9%), especially in patients with UV-. In the international survey by Stahl et al.,[13] 69% of specialists in Germany, 68% in the United Kingdom, and 49% in France first opted for radial shortening. This preference differs in part from the literature, where Camus and Van Overstraeten,[1] Henry et al.,[2] and Fontaine[3] recommend immobilization and clinical follow-up, reserving surgery for symptom progression. In the survey by the American Society for Surgery of the Hand (ASSH) conducted by Danoff et al.,[14] including 220 hand surgeons, 74% indicated conservative treatment and 26% indicated early surgical intervention, with radial shortening osteotomy being the most common procedure (51% of operated cases). In cases of UV+ and neutral, a greater variety of responses was observed, with a predominance of immobilization (35.6%), also for 6 weeks (54.2%), as well as core decompression (24.4%), and capitate osteotomy (11.1%), in line with Camus and Van Overstraeten,[1] Fontaine,[3] Chojnowski et al.[7] and Lichtman et al.[10]

In stage II, for UV-, most surgeons also opted for radial shortening osteotomy (69.6%), between 2 (67.0%) and 3 mm (16.0%); followed by core decompression (10.4%); and vascularized bone graft (5.9%), with the main vascular pedicle with bone graft of the 1st and 2nd intercompartmental arteries (Zaidemberg: 50%). Regarding UV+, the study presented the following as the main options: core decompression (25.2%); capitate shortening osteotomy (24.4%); and vascularized bone graft (18.5%), the main one was the graft of the vascular pedicle with bone graft of the 4th extracompartmental artery (Sheetz: 60%). Such options are in accordance with Camus and Van Overstraeten,[1] Henry et al.,[2] Fontaine,[3] Lichtman and Pientka,[5] Chojnowski et al.,[7] and Lichtman et al.,[10] who suggest radial shortening osteotomy for UV- and capitate for UV+.

In the ASSH survey,[14] 63% of surgeons opted for surgery at this stage, with radial shortening osteotomy being the most common procedure. Similarly, Kolovich et al.[15] observed that radial shortening osteotomy was the most frequent option (52%) among ASSH members for stages II to IIIA with UV-. The results of Viljakka et al.,[8] in their Finnish population study, also show that leveling osteotomy (capitate or radial shortening osteotomy) accounts for more than 60% of surgeries performed in the initial and intermediate stages.

Table 3 Comparative analysis of techniques (%) between specialists (S) and residents (R) in the different stages of Kienböck's disease

Comparation between S (109) x R (26)											
		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10
Immobilization	S R	32.1 42.3	33.9 42.3	1.8 -	2.8 -	- -	- -	- -	- -	- -	- -
Core decompression	S R	16.5 15.4	24.8 23.1	9.2 15.4	25.7 23.1	3.7 7.7	7.3 15.4	- 3.8	- 3.8	- 3.8	- 3.8
Vascularized bone graft	S R	- 3.8	6.4 -	6.4 3.8	21.1 7.7	11.9 19.2	19.3 26.9	0.9 -	- -	- -	- -
Temporary fixation	S R	1.8 -	2.8 3.8	- 3.8	2.8 11.5	0.9 -	0.9 3.8	0.9 -	0.9 -	- -	- -
Radial shortening osteotomy	S R	42.2 30.8	2.8 -	71.6 61.5	3.7 3.8	33.9 34.6	3.7 3.8	2.8 7.7	- -	- -	- -
Radial closing-wedge osteotomy	S R	0.9 -	5.5 -	2.8 -	11.0 3.8	2.8 -	6.4 3.8	- -	0.9 -	- -	- -
Capitate shortening osteotomy	S R	- -	11.0 11.5	1.8 -	23.9 26.9	- -	8.3 3.8	- -	0.9 -	- -	- -
Partial wrist arthrodesis	S R	- -	- -	0.9 -	1.8 -	17.4 3.8	21.1 7.7	24.8 15.4	22.9 19.2	3.7 3.8	4.6 3.8
Semilunar resection	S R	- -	- -	- -	- 3.8	- 3.8	1.8 3.8	0.9 -	1.8 -	0.9 -	0.9 -
Proximal row carpectomy	S R	- -	- -	- -	- -	23.9 15.4	22.9 15.4	61.5 57.7	63.3 57.7	19.3 11.5	18.3 11.5
Total wrist arthrodesis	S R	- -	- -	- -	- -	- -	- -	5.5 -	6.4 3.8	69.7 65.4	69.7 65.4
Arthroscopy	S R	3.7 7.7	7.3 15.4	1.8 15.4	4.6 15.4	2.8 15.4	2.8 15.4	1.8 15.4	1.8 15.4	2.8 15.4	2.8 15.4
Other	S R	2.8 -	5.5 3.8	3.7 -	3.7 3.8	2.8 -	5.5 -	0.9 -	0.9 -	3.7 -	3.7 -
Total	S R	100 100	100 100	100 100	100 100	100 100	100 100	100 100	100 100	100 100	100 100
p-value		**0.357**	**0.649**	**0.048***	**0.097**	**0.045***	**0.132**	**0.042***	**0.098**	**0.050**	**0.052**

Abbreviation: R, residents; S, specialists.
Notes: Data are presented in pairs per cell, with the highest value referring to S and the lowest to R. **p*-value with statistical significance.

In stage IIIA, UV- maintained the predominance of radial shortening osteotomy (34.1%), with an increase in the frequency of proximal row carpectomy (22.2%) and partial wrist arthrodesis (14.8%), with scaphocapitate arthrodesis being the most performed (65%). For UV+ and neutral, greater heterogeneity was observed: proximal row carpectomy (21.5%); vascularized bone graft (20.7%), mainly by the Sheetz method (75%); and partial wrist arthrodesis (18.5%).

These results were similar to those observed in systematic reviews. Henry et al.[2] suggest that the therapeutic choice should be based on the viability of UVs and lunate variances. In the ASSH survey,[14] 69% of surgeons indicated radial shortening osteotomy for stage IIIA with UV-, while for neutral UV, there was a balanced distribution between vascularized bone graft and proximal row carpectomy. Kolovich et al.[15] observed a similar pattern, with a predominance of radial shortening osteotomy (47%) and vascularized bone graft (21%). Wang et al.[17] reported similar results in a systematic review (n = 189), without detailing the UV type, with the main vascularized bone graft (23.8%), followed by radial shortening (20.6%) and capitate shortening (13.8%) osteotomies.

In stage IIIB, we obtained a wide range of techniques, with little influence from UV (negative/positive). Proximal row carpectomy (UV-: 60.7%; UV+: 62.2%) and partial carpal arthrodesis (UV-: 23%; UV+: 22.2%), maintaining preference for the scaphocapitate technique (UV-: 74.2%; UV+: 70%).

In the study by Danoff et al.,[14] proximal row carpectomy was the most cited procedure (42%), followed by partial arthrodesis (21%), and total arthrodesis (10.7%). Similarly, Kolovich et al.[16] and Stahl et al.[13] identified proximal row carpectomy as the most widely used treatment for advanced stages (45–55% of cases). Viljakka et al.[8] observed that the proportion of proximal row carpectomy increased progressively with stage, representing more than 70% of surgeries in stage IIIb. In the study by Wang et al.,[17] the most common procedures were preservative interventions, such as partial wrist arthrodesis (30.5%) and radial shortening osteotomy (26.4%), followed by proximal row carpectomy (17.3%).

In the advanced stages (IV), total wrist arthrodesis was the most frequent (68.9%), followed by proximal row carpectomy (UV-: 17.8%; UV+: 17%). This shows that when there is generalized joint degeneration, preservation procedures do not provide satisfactory long-term results. In the ASSH survey,[14] 87% of surgeons indicated proximal row carpectomy or total arthrodesis. Fontaine[3] and Lichtman and Pientka[5] also report that, at this stage, radiocarpal degeneration makes total arthrodesis the most indicated treatment. Similarly, Viljakka et al.[8] reported that arthrodesis represents more than 80% of surgeries in stage IV cases. In the review by Wang et al. (n = 114),[18] most opted for salvage (37.7%), followed by arthrodesis 20.2%, and proximal row carpectomy 15.8%.

Regarding revascularization techniques, the use of the vascular pedicle with bone graft from the 4th and 5th extracompartmental arteries predominated, a technique described by Sheetz and widely used in a recent series.[15,16]

The inclusion of residents (19.3%) enabled us to identify that experience level influences decision-making across scenarios (II, IIIA, and IIIB). Residents tended to be more inclined to arthroscopy, possibly reflecting the influence of the training environment, recent exposure to multiple techniques, and less consolidation of experience-based techniques. Despite this, the overall treatment trend in Brazil was consistent across training levels. The statistical similarity in most cases (7/10) reinforces the validity of the sample's overall results.

Conclusion

The analysis demonstrates that, in therapeutic indications for young adult patients with Kienbock's disease, there is consensus for stage II radial shortening osteotomy with UV-, stage IIIB proximal row carpectomy, and stage IV total wrist arthrodesis. In the remaining stages, there was no defined consensus, showing significant variability in the procedures. The comparison between specialists and residents revealed specific differences in certain scenarios, without substantial changes in the overall standard of treatment.

Data Availability

Data will be available upon request to the corresponding author.

Authors' Contributions

BSB: conceptualization, data curation and analysis, and writing – original draft; MFR: conceptualization, methodology, and formal analysis; JRN, WGC and AO; writing – review & editing; and JCB: conceptualization, methodology, and writing – review & editing.

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Conflict of Interests

The authors have no conflict of interests to declare.

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Appendix 1 Study form

https://docs.google.com/forms/d/e/1FAIpQLSfvhPd4g6HliYzJi8zHYoO51Ml9kyo0jZDvVbqrC17-dNauew/viewform?usp=dialog.