Original Article Clinics in Orthopedic Surgery 2024;16:335-341 • https://doi.org/10.4055/cios23333

Is Surgical Treatment Necessary for the Treatment of a Jones Fracture?: A Retrospective Study

Changsu Kim, MD, Dong Young Shin, MD, Jiyoun Kim, MD

Department of Orthopaedic Surgery, Kosin University Gospel Hospital, Busan, Korea

Background: Jones fractures are common injuries that can be treated conservatively or surgically. However, the optimal treatment approach remains controversial. This study aimed to compare the clinical outcomes of conservative and operative treatments for Jones fractures and determine whether surgical treatment is necessary.

Methods: A retrospective study was conducted on 69 patients with Jones fractures treated at our hospital. The patients were divided into 2 groups: conservative (C group; n = 46) and operative (O group; n = 23) treatments. Patients were followed up after 2, 6, and 12 weeks, and every 3 months thereafter. However, outpatient follow-ups were conducted between 8 and 10 weeks as needed. The mean follow-up period was 14.5 weeks (range, 12–24 weeks). In group C, the patients were treated with a non-weight-bearing cast for 4–6 weeks, followed by additional weight-bearing boot immobilization before returning to exercise. In group O, patients were treated surgically using a bicortical screw or intramedullary internal fixation. Time to radiologic union, clinical union, return to sports, visual analog scale (VAS), Foot Function Index-Revised Short Form (FFI-RS), and American Orthopedic Foot and Ankle Society (AOFAS) scores were evaluated.

Results: Sixty-nine patients were included in the analysis. There were statistically significant differences in the time to radiologic union and return to sports, VAS score in the second week, and FFI-RS score in the 12th week. In group C, favorable outcomes were observed in terms of the time to return to sports, VAS score in the second week, and FFI-RS score in the 12th week. Contrastingly, in group O, better results were observed in time to radiologic union. The AOFAS score was excellent at the final follow-up, with no significant differences between groups. Complication rates were 10.8% and 13% in groups C and O, respectively.

Conclusions: Surgical treatment is sometimes necessary for Jones fractures, but conservative treatment should also be considered because of the favorable outcomes. Conservative treatment can be a good option for patients who are risk-averse and place a high value on fracture healing without surgery.

Keywords: *Jones fracture, Fifth metatarsal fractures, Conservative treatment*

Fifth metatarsal fractures are among the most frequent metatarsal injuries, with a reported incidence of 6.7 of 10,000 individuals.[1] These fractures can occur due to direct trauma to the area or inversion injuries with plantar flexion. In athletes, these fractures can have serious consequences, including competition time and refracture, which can prevent them from resuming their sport.[2]

Fractures of the proximal fifth metatarsal were subdivided into 3 regions as described by Lawrence and Botte.[3] Base fractures of the fifth metatarsal can be treated using nonsurgical or surgical methods. Surgical approaches involve bicortical screws or intramedullary internal fixation, whereas nonsurgical approaches involve immobilization casting to promote passive weight-bearing healing. However, the best treatment approach for base fractures of the fifth metatarsal, particularly zone II fractures, remains controversial.

Received October 24, 2023; Accepted November 17, 2023
Correspondence to: Jiyoun Kim, MD
Department of Orthopaedic Surgery, Kosin University Gospel Hospital, 262 Gamcheon-ro, Seo-gu, Busan 49267, Korea
Tel: +82-51-990-6467, Fax: +82-51-990-3071
E-mail: orthojikim@gmail.com

Copyright © 2024 by The Korean Orthopaedic Association
This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (http://creativecommons.org/licenses/by-nc/4.0) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Some studies have suggested that conservative treatment may not be the best long-term option for athletes with displaced avulsion fractures of the fifth metatarsal base because it can lead to delayed healing and resumption of activity.[4] Other studies have recommended nonsurgical interventions to promote rehabilitation because they can avoid surgery-related discomfort and complications and are cost-effective methods.[5]

This study aimed to compare the radiological and clinical outcomes of fifth metatarsal base fractures treated with conservative management or intramedullary screw fixation. We hypothesized there would be no significant difference in outcomes between the 2 groups after treatment.

METHODS

This study was approved by the Institutional Review Board of Kosin University Gospel Hospital (No. 2023-06-018). Informed consent was obtained from patients.

Patients

We retrospectively reviewed 69 patients (69 cases) who were diagnosed with fractures at the base of the fifth metatarsal in zone 2 and underwent conservative (46 cases) or operative (23 cases) treatment according to the standard treatment protocol at our hospital between October 2006 and February 2022. The patients were categorized into 2 groups according to treatment plan: the conservative treatment (C group; n = 46) and operative treatment (O group; n = 23) groups. The patients were followed up after 2, 6, and 12 weeks, and every 3 months thereafter. However, outpatient follow-ups were conducted between 8 and 10 weeks as needed. The mean follow-up period was 14.5 weeks (range, 12–24 weeks). Outpatient follow-up was continued until union was confirmed on radiographs.

Conservative and Surgical Treatment

Forty-six patients were treated conservatively with a non-weight-bearing cast for 4–6 weeks. This was followed by additional weight-bearing boot immobilization before returning to exercise. Patients visited the outpatient clinics at 2, 6, and 12 months and every 3 months thereafter until union was confirmed radiographically. If the patient's pain was eliminated or minimal at the outpatient visit, they were allowed to start full weight-bearing with normal shoes (Fig. 1).

Twenty-three patients were treated surgically using either bicortical screws or intramedullary internal fixation (Fig. 2). Surgical treatment was performed on patients with displaced fractures or on patients who desired an early return to their daily lives. All surgeries were performed by the same surgeon (JK).

Fig. 1. A typical case from the conservative treatment group. (A-C) Plain radiographs taken immediately after trauma, representing the anteroposterior (AP), oblique, and lateral views, respectively. (D-F) Images at 12th weeks after conservative treatment, each showing the AP, oblique, and lateral views, respectively.

Fig. 2. A typical case from the operative treatment group. (A-C) Plain radiographs taken immediately after trauma, representing the anteroposterior (AP), lateral, and oblique views, respectively. (D-F) Images at 12th weeks after conservative treatment, each showing the AP, lateral, and oblique views, respectively.

Outcome Measures

Plain radiography was used to capture images of the anterior and posterior aspects, lateral views, and oblique angles of the foot. Bony union was defined as the observation of cortex bridging and callus in 3 out of 4 cortex from all views.[6] At outpatient visits, simple radiography of the foot was performed to confirm the timing of bony union and the time frame for resuming activity. Clinical union was defined as the absence of tenderness to palpation and painless ambulation. The timeframe for resuming activity was analyzed regardless of union status. The clinical outcomes were evaluated using the American Orthopedic Foot and Ankle Society (AOFAS) score at the last follow-up. The visual analog scale (VAS) score and Foot Function Index-Revised Short Form (FFI-RS) scores were evaluated at every outpatient follow-up. Each result was statistically evaluated using the Mann-Whitney *U*-test. Results were considered significant when the *p*-value was less than 0.05.

Scoring System

The following outcomes were assessed during follow-up: functional outcomes, patient satisfaction scores, motion range, and complications. Functional outcomes included the FFI-RS and AOFAS. The postoperative complications included infection, nonunion or delayed union, stiffness, refracture, and internal fixation loosening. The AOFAS scores are composed of 4 scoring systems, each of which contains 2 parts. The first part is subjective and should be addressed by the patient; the second part is objective and requires clinical examination. The most relevant score was assigned based on the affected anatomical area. The 4 scoring systems include an examination of anatomical joint alignment. However, in these 4 systems, the functional items were divided into different subitems. The highest total score is 100. The higher the score, the better the patient's condition. The FFI-RS is composed of 34 items divided into 5 subscales: pain, stiffness, difficulty, activity limitation, and social issues. The answers to each question range from 1 (no discomfort) to 4 (severe discomfort) points. The intensity of pain was assessed using the 100-mm horizontal VAS, where 0 mm was no pain and 100 mm was extreme pain. The level was compared between the groups.

RESULTS

A total of 69 patients, (32 men and 37 women), with a mean age of 50.5 years (range, 10–85 years), participated in this study. When comparing the conservative and operative treatment groups, the radiographic union time was on average 15.5 weeks and 12.5 weeks in the conservative and operative treatment groups, respectively. This was a difference of 3.0 weeks, which was significant. The average clinical union time was on average 9.7 weeks and 10.7 weeks in the conservative and operative treatment groups, respectively. The mean duration until return to sport was

Table 1. Outcomes Analysis of the Conservative Treatment Group and Operative Treatment Group

	Group	N	Mean ± SD	*U*-test	*p*-value
Rad	Conservative	46	15.46 ± 5.44	391.5	0.014
	Operative	23	12.52 ± 2.50		
Cli	Conservative	46	9.72 ± 2.02	396.0	0.063
	Operative	23	10.70 ± 2.53		
Sports	Conservative	46	11.61 ± 0.88	418.0	0.016
	Operative	23	12.52 ± 2.50		
AOFAS_L	Conservative	46	97.52 ± 1.33	516.0	0.861
	Operative	23	97.70 ± 0.63		
VAS 2	Conservative	46	4.28 ± 0.54	326.0	0.004
	Operative	23	4.78 ± 0.67		
VAS 6	Conservative	46	2.87 ± 0.34	483.0	0.356
	Operative	23	2.78 ± 0.42		
VAS 12	Conservative	46	1.78 ± 0.47	481.5	0.398
	Operative	23	1.87 ± 0.34		
FFI-RS 0	Conservative	46	100.59 ± 1.15	404.0	0.099
	Operative	23	101.00 ± 1.09		
FFI-RS 2	Conservative	46	94.63 ± 1.85	360.0	0.027
	Operative	23	95.39 ± 1.08		
FFI-RS 6	Conservative	46	70.28 ± 1.38	439.5	0.216
	Operative	23	70.48 ± 1.31		
FFI-RS 12	Conservative	46	51.13 ± 1.57	21.5	0.000
	Operative	23	57.39 ± 2.06		

SD: standard deviation, Rad: time to radiologic union, Cli: time to clinical union, Sports: time to return to sports, AOFAS_L: American Orthopedic Foot and Ankle Society (AOFAS) score at the last follow-up, VAS 2: visual analog scale (VAS) score at the second-week follow-up, VAS 6: VAS score at the sixth-week follow-up, VAS 12: VAS score at the 12th-week follow-up, FFI-RS 0: Foot Function Index Revised Short Form (FFI-RS) score at the initial follow-up, FFI-RS 2: FFI-RS score at the second-week follow-up, FFI-RS 6: FFI-RS score at the sixth-week follow-up, FFI-RS 12: FFI-RS score at the 12th-week follow-up.

significantly shorter in the conservative group (11.6 weeks vs. 12.5 weeks) (Table 1).

At the 2-week follow-up, the VAS scores were significantly lower in the conservative group (4.28 vs. 4.78). At the 12-week follow-up, the VAS score was excellent in both the C (1.78) and O (1.87) groups. At the last follow-up, the AOFAS scores were excellent in both groups C (97.5) and O (97.7) (Fig. 3).

The FFI-RS scores were lower at the 2- and 12-week follow-up in group C than group O (94.6 and 51.1 vs. 95.4 and 57.4). The FFI-RS score at 12 weeks was significantly lower in group C (Fig. 4). Complications included delayed union in 10.8% of patients (5/46) in the conservative treatment group. Infection (1 case), nonunion (1 case), and discomfort caused by metal (1 case) were the complications in the operative treatment group, which had a complication rate of 13% (3/23).

DISCUSSION

The fifth metatarsal is the most commonly fractured metatarsal bone. However, the periosteum is excluded from the lateral aspect of the base of the fifth metatarsal. The third peroneal tendon is attached to the lateral aspect of the base

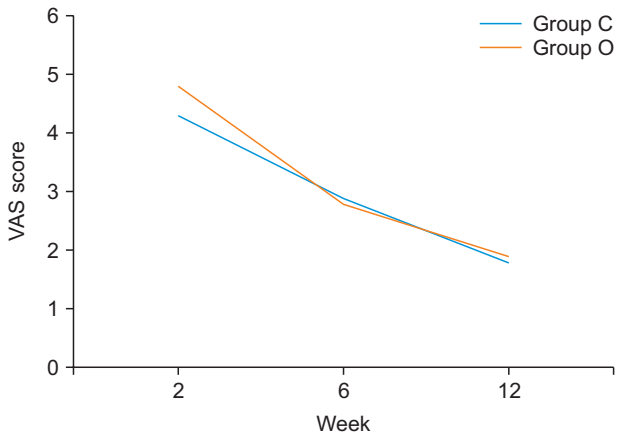

Fig. 3. Visual analog scale (VAS) scores of group C (conservative treatment group) and group O (operative treatment group).

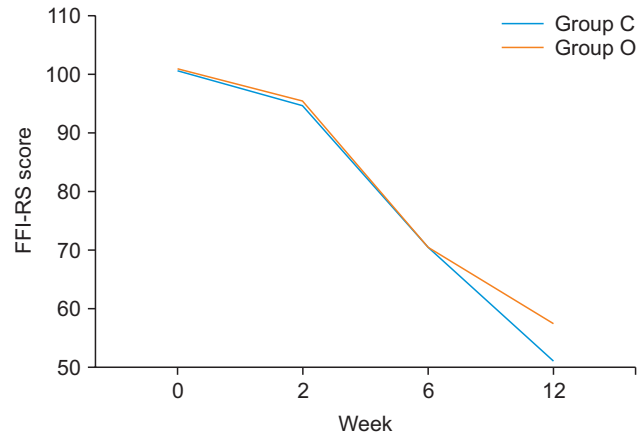

Fig. 4. Foot Function Index Revised Short Form (FFI-RS) scores of group C (conservative treatment group) and group O (operative treatment group).

of the fifth metatarsal, the lateral band of the plantar aponeurosis is attached to the plantar surface of the fifth metatarsal, and the interosseous ligament is attached between the bases of the fourth and fifth metatarsals. The nutrient artery supplies the tuberosity and runs retrogradely from the dorsal arterial arch to the metatarsal-medullary canal. There is an avascular zone between the tuberosity and metatarsal-medullary canal, which is vulnerable to delayed union or nonunion after a fracture. Fractures at the base of the fifth metatarsal are divided into 3 zones depending on their location. Zone 1 is a tuberosity avulsion fracture that can extend to the articular surface of the fifth metatarsal-cuboid joint. Zone 2 is commonly known as a Jones fracture, which is a fracture at the metaphyseal-diaphyseal junction of the fifth metatarsal. Zone 3 is a stress fracture of the metatarsal shaft.[5)]

Although controversy persists, the current trend in orthopedic care has been to treat nondisplaced zone 1 fractures conservatively, significantly displaced zone 1 fractures surgically, and zone 2 and 3 fractures either conservatively or surgically, depending on the overall patient expectations and activity level.[7-10)]

Fractures in the second zone occur because of excessive pronation of the forefoot during plantar flexion, and fractures usually occur at the distal base, where the ligaments between the fourth and fifth metatarsals resist displacement. Acute nondisplaced fractures are conventionally treated with non-weight-bearing cast immobilization for 6–8 weeks.[11)]

However, conservative treatment of second-zone fractures is associated with a high incidence of delayed union and nonunion, as this zone is an avascular region and continuous movement at the fracture site is facilitated by the peroneus brevis tendon and the lateral band of the plantar fascia.[3)]

Josefsson et al.[12)] demonstrated a union rate surpassing 95%, coupled with satisfactory long-term outcomes and favorable functional results, all achieved through the implementation of nonoperative measures involving short-leg cast immobilization. Nonetheless, a noteworthy drawback of this approach manifested as a protracted union time and an extended interval before patients could achieve a full return to their functional capacities. It is noteworthy that within their study cohort encompassing 44 patients, 18 individuals ultimately required secondary surgical interventions due to delayed union.

In a study by Torg et al.,[13)] 15 patients with Jones fractures were treated with non-weight-bearing cast immobilization, whereas 10 were treated with weight-bearing cast immobilization. Of those in the non-weight-bearing group, 14 achieved bony union after an average of 7 weeks, while 6 achieved bony union and 4 had a mean delay in union of 11 months in the weight-bearing group. Accordingly, the study concluded that non-weight-bearing cast immobilization was superior.

Cheung and Lui[2)] posited that Type II fractures exhibit therapeutic versatility, amenable to both conservative and surgical modalities contingent upon the functional exigencies of the individual. Although conservative management typically yields favorable outcomes with eventual fracture healing, expedited union and reduced immobilization periods can be achieved through timely surgical intervention. Rosenberg and Sferra[14)] shared a comparable perspective in their review article concerning the management of zone 2 and 3 fractures. They advocated for a conservative approach, suggesting the use of a non-weight-bearing short leg cast for 6 to 8 weeks in cases of acute fractures among non-athletic patients. Conversely,

for athletic patients, they recommended surgical fixation to promote swifter healing and a quicker return to normal function. In instances of delayed union or nonunion, their recommendation leaned towards surgical intervention, with the possibility of incorporating bone grafts as needed. In a study by Lee et al.,[15] conservative treatment yielded favorable clinical outcomes for zone 1 fractures, regardless of the fracture gap. Similarly, in our study, conservative treatment also resulted in favorable clinical outcomes for zone 2 fractures. Further research is needed to investigate whether there are differences in clinical outcomes based on the fracture gap for Jones fractures.

Several studies have reported complications that may arise with the surgical treatment of Jones fractures. Possible complications include hardware failure and refracture, sural nerve injury,[16] malunion, delayed union/nonunion, screw head prominence, chronic low-level pain,[17] and iatrogenic fractures.[16,18] However, Josefsson et al.[19] compared 2 groups of patients consisting of 66 individuals: 27 with acute Jones fractures and 39 with chronic Jones fractures. The group that underwent surgical treatment achieved bony union in all cases, whereas the conservative treatment group experienced delayed union or refracture in 12% of the acute fractures and 50% of the chronic fractures.

Thus, the study indicates that patients deemed to be at high risk for surgery, with a predisposition to complications such as vasculopathy or diabetic neuropathy, should be treated nonoperatively. In this study, satisfactory results were achieved both radiographically and clinically with conservative treatment. The group of patients who underwent surgical treatment were eager to return to exercise quickly and desired a shorter recovery period. However, contrary to their expectations, they experienced postoperative pain and were unable to return to their sport activities as quickly as they had hoped. Also due to a high physical activity demand of group O, they relatively did not adhere well to the weight-bearing restrictions. These characteristics could be associated with a slower clinical bone union.

In this study, we utilized patient-reported outcome measures (PROMs) to evaluate the outcomes of treatment. Specifically, we used the VAS for assessing pain. Additionally, we utilized PROMs, such as AOFAS and FFI-RS. FFI-RS served as a region-specific PROM, offering a relatively objective assessment metric that did not correlate with AOFAS, thus providing a more objective evaluation. Since the choice of PROMs can influence the results and reliability of a study, it is important to select trustworthy PROMs.[20]

Generally, it is important for athletes to achieve both clinical and radiological union as they engage in high-intensity exercise and training. However, in the general population, pain reduction and the restoration of functionality in daily life are more important considerations. From this perspective, the C group demonstrated better outcomes in VAS of the second week, FFI-RS of the second week. and return to sports. Therefore, conservative treatment, focusing on pain reduction and return to normal activities, can be considered a viable therapeutic option with favorable results, particularly in the general population.

However, the limitations of this study include the small number of cases and relatively short follow-up period. Another limitation is that the timing of initiating full weight-bearing during walking varied due to differences in the time of pain resolution. Lastly, additional research is required to investigate the influence of factors such as the fracture gap, patient characteristics (body mass index, athletic status, and sex), and the surgical approach on clinical outcomes. Multiple medical specialties are involved in the evaluation and treatment of Jones fractures; however, the best treatment for acute Jones fractures remains controversial. Our results support the treatment of acute Jones fractures in the low-demand, (non-elite athlete) population in a non-weight-bearing cast for 4–6 weeks, followed by additional weight-bearing boot immobilization before return to exercise. This treatment has the potential to decrease the need for surgery, prolonged follow-up, and burden on older patients to risk surgery while maintaining satisfactory outcomes. Increased evidence of successful conservative treatment may help alter how other medical specialties manage acute Jones fractures.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

ACKNOWLEDGEMENTS

This article was presented in the 67th Annual Congress of the Korean Orthopaedic Association 2023.

ORCID

Changsu Kim https://orcid.org/0000-0002-4660-7794
Dong Young Shin https://orcid.org/0009-0001-8508-5589
Jiyoun Kim https://orcid.org/0000-0002-4239-3848

REFERENCES

1. Qi R, Li B, Xie T, Yin H. Surgical versus conservative management of fifth metatarsal fractures in adults: a protocol of retrospective study. Medicine (Baltimore). 2020;99(42): e22800.
2. Cheung CN, Lui TH. Proximal fifth metatarsal fractures: anatomy, classification, treatment and complications. Arch Trauma Res. 2016;5(4):e33298.
3. Lawrence SJ, Botte MJ. Jones' fractures and related fractures of the proximal fifth metatarsal. Foot Ankle. 1993;14(6):358-65.
4. Wang Y, Gan X, Li K, Ma T, Zhang Y. Comparison of operative and non-operative management of fifth metatarsal base fracture: a meta-analysis. PLoS One. 2020;15(8):e0237151.
5. Gwak HC, Park DH, Kim JH, Lee CR, Kwon YU, Kim DS. Outcome of conservative treatment of the zone I, II 5th metatarsal base fracture under early weight-bearing. J Korean Orthop Assoc. 2021;56(2):150-6.
6. Gomez-Barrena E, Padilla-Eguiluz NG, Garcia-Rey E, et al. Validation of a long bone fracture non-union healing score after treatment with mesenchymal stromal cells combined to biomaterials. Injury. 2020;51 Suppl 1:S55-62.
7. Kerkhoffs GM, Versteegh VE, Sierevelt IN, Kloen P, van Dijk CN. Treatment of proximal metatarsal V fractures in athletes and non-athletes. Br J Sports Med. 2012;46(9):644-8.
8. Kim JB, Song IS, Park BS, Ahn CH, Kim CU. Comparison of the outcomes between headless cannulated screw fixation and fixation using a locking compression distal ulna hook plate in fracture of fifth metatarsal base. J Foot Ankle Surg. 2017;56(4):713-7.
9. Vorlat P, Achtergael W, Haentjens P. Predictors of outcome of non-displaced fractures of the base of the fifth metatarsal. Int Orthop. 2007;31(1):5-10.
10. Yates J, Feeley I, Sasikumar S, Rattan G, Hannigan A, Sheehan E. Jones fracture of the fifth metatarsal: is operative intervention justified?: a systematic review of the literature and meta-analysis of results. Foot (Edinb). 2015;25(4):251-7.
11. Coughlin MJ, Mann RA, Saltzman CL. Surgery of the foot and ankle. 8th ed. Mosby Elsevier; 2007. 2199-235.
12. Josefsson PO, Karlsson M, Redlund-Johnell I, Wendeberg B. Closed treatment of Jones fracture: good results in 40 cases after 11-26 years. Acta Orthop Scand. 1994;65(5):545-7.
13. Torg JS, Balduini FC, Zelko RR, Pavlov H, Peff TC, Das M. Fractures of the base of the fifth metatarsal distal to the tuberosity: classification and guidelines for non-surgical and surgical management. J Bone Joint Surg Am. 1984;66(2): 209-14.
14. Rosenberg GA, Sferra JJ. Treatment strategies for acute fractures and nonunions of the proximal fifth metatarsal. J Am Acad Orthop Surg. 2000;8(5):332-8.
15. Lee TH, Lee JH, Chay SW, Jang KS, Kim HJ. Comparison of clinical and radiologic outcomes between non-operative and operative treatment in 5th metatarsal base fractures (Zone 1). Injury. 2016;47(8):1789-93.
16. Donley BG, McCollum MJ, Murphy GA, Richardson EG. Risk of sural nerve injury with intramedullary screw fixation of fifth metatarsal fractures: a cadaver study. Foot Ankle Int. 1999;20(3):182-4.
17. Bigsby E, Halliday R, Middleton RG, Case R, Harries W. Functional outcome of fifth metatarsal fractures. Injury. 2014;45(12):2009-12.
18. DeLee JC, Evans JP, Julian J. Stress fracture of the fifth metatarsal. Am J Sports Med. 1983;11(5):349-53.
19. Josefsson PO, Karlsson M, Redlund-Johnell I, Wendeberg B. Jones fracture: surgical versus nonsurgical treatment. Clin Orthop Relat Res. 1994;(299):252-5.
20. Kim J, Kim BS. Patient-reported outcome measures of the foot and ankle. J Korean Foot Ankle Soc. 2022;26(1):1-8.