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Magnetic Stimulation Combined with Exercise for Pain Relief in Patients with End-Stage Renal Disease

Juyeon Kim[1], Heegoo Kim[1,2], Seyoung Shin[1,2,3], Eun-Hye Chung[1], Se-Young Bak[1], HyeongMin Jeon[1,2,3] and MinYoung Kim[1,2,3*]

[1]Department of Rehabilitation Medicine, CHA Bundang Medical Center, CHA University School of Medicine, Seongnam, Republic of Korea,
[2]Digital Therapeutics Research Team, CHA Future Medicine Research Institute, Seongnam, Republic of Korea,
[3]Rehabilitation and Regeneration Research Center, CHA University School of Medicine, Seongnam, 13496, Republic of Korea

Background and Purpose

- **Background**
  - Patients with end-stage renal disease (ESRD) on hemodialysis frequently experience chronic low back pain and reduced physical function.
  - To address this issue, a combined intervention consisting of magnetic stimulation and exercise may be beneficial; however, the effects of this combined approach remain underexplored.
- **Purpose**
  - This study aimed to evaluate the effects of a 4-week intervention consisting of magnetic stimulation combined with exercise on pain reduction, improvement in physical performance, and quality of life (QoL).

Methods

- **Participants**
  - Six ESRD patients on maintenance hemodialysis with chronic low back pain participated in this study (Median age: 56.0 years).
- **Intervention (4 Weeks)**
  - **Magnetic stimulation:** Magnetic stimulation was administered using the PERFECT® device (Remed Co., Ltd., Korea) at up to 3.0 Tesla for 30 minutes per session, three times per week, for 4 weeks, targeting the erector spinae, gluteus maximus, and hamstrings.
  - **Exercise:** Exercise intervention consisted of bridge, McKenzie extension, and hip extension exercises performed three times per week in the hospital under supervision, along with daily home-based exercise.
- **Outcome Measures**
  - Clinical evaluations were performed at baseline (T0) and after the 4-week intervention (T1).
  - Outcome measures included pain assessed by the Visual Analog Scale (VAS), physical function evaluated using the Short Physical Performance Battery (SPPB), muscle strength measured by Hand Grip Strength (HGS), and quality of life assessed with the World Health Organization Quality of Life-BREF (WHOQOL-BREF).
- **Analysis**
  - Wilcoxon signed-rank test was used to compare the changes between T0 and T1. ($p < 0.05$)

Figure 1. Example of magnetic stimulation setup.

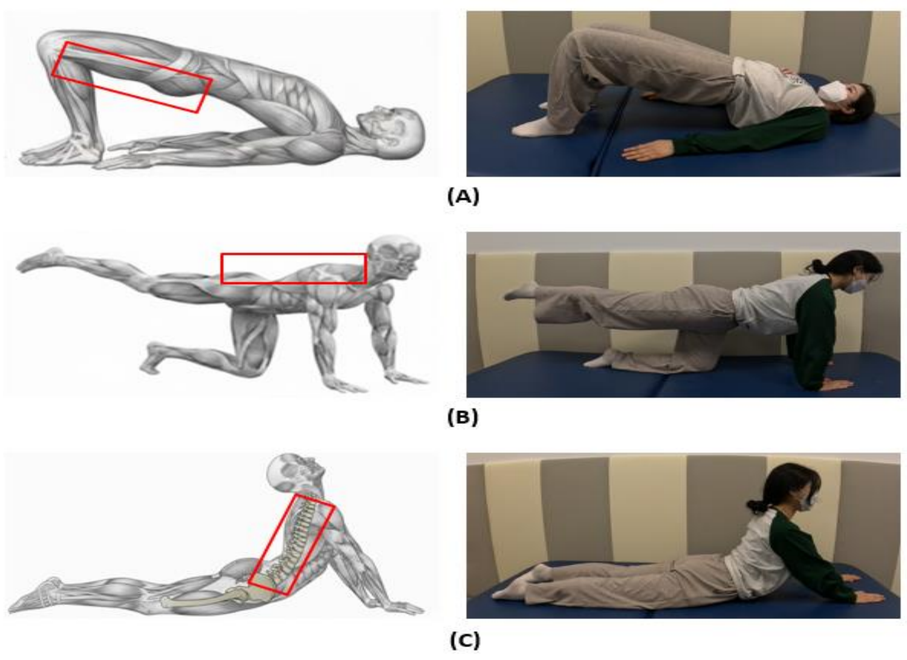

Figure 2. Intervention exercise protocol.
(A) Bridge exercise, (B) Hip extension exercise, (C) McKenzie extension exercise

Results

- **Pain**
  - As illustrated in Figure 3A, the VAS score showed a statistically significant decrease following the 4-week intervention period compared with baseline **($p = 0.027$*)**.
- **Physical Function and Strength**
  - SPPB showed a trend toward improvement, but did not reach statistical significance ($p = 0.066$; Figure 3B).
  - HGS did not show a statistically significant change during the study period (p = 0.753; Figure 3C).
- **Quality of life (WHOQOL-BREF)**
  - No statistically significant changes were observed in the WHOQOL total score or its individual domains ($p = 0.686$; Table 1).

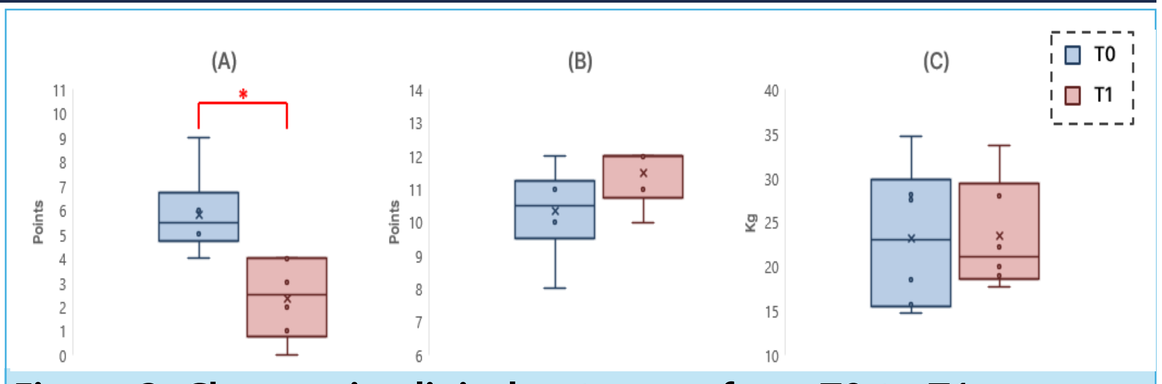

Figure 3. Changes in clinical outcomes from T0 to T1. (A) VAS, (B) SPPB, (C) HGS. Data are presented as median (IQR). *$p < 0.05$.

Table 1. Comparison of WHOQOL-BREF Domain Scores between T0 and T1

Domain (points)	T0 (n = 6)	T1 (n = 6)	*p*-value
Physical	16.50(8.00)	19.50(5.00)	0.343
Psychological	20.00(9.00)	19.00(2.00)	0.498
Social relationships	9.00(3.00)	9.00(2.00)	1.000
Environment	26.00(8.00)	24.50(4.00)	0.588

Values are presented as Median (IQR).

Conclusion

- This results of study could demonstrate that combined intervention of magnetic stimulation and exercise could reduce low back pain in ESRD patients.
- These findings suggest that this combined approach may represent a feasible and clinically applicable strategy for pain management in patients undergoing dialysis.

Acknowledgement

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