

## ORAL PRESENTATION 1-1

물리학

발표일시 및 장소 : 10 월 26 일(금) 13:15-13:25 Room B(5F)

### OP1-1-1

#### **Does microcurrent intensity affect regenerative effects on muscle atrophy in an immobilised rabbit?**

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#### **Objective**

To investigate the intensity-specific regenerative effects of microcurrent therapy (MT) on gastrocnemius (GCM) muscle atrophy induced by cast-immobilization in rabbits.

#### **Methods**

Fifteen rabbits were randomly allocated to 3 groups. The right GCM muscle was immobilized by cast (IC) for 2 weeks. Fifteen rabbits were randomly allocated to 3 groups after cast removal (CR): IC and sham MT for 2 weeks (group 1); IC and MT (25 uA) for 2 weeks (group 2); IC and MT (5000 uA) for 2 weeks (group 3). Atrophic change in calf circumference, compound muscle action potential (CMAP) of the tibial nerve, thickness of the GCM muscle, Cross sectional area (CSA) of GCM muscle fibres was measured in right side. Proliferating cell nuclear antigen (PCNA) or bromodeoxyuridine (BrdU)-positive cell ratio was estimated as the number of PCNA or BrdU-positive cells per muscle fibre.

#### **Results**

Mean atrophic changes in calf circumference, amplitude of CMAP of the tibial nerve, and GCM muscle thickness in group 2 and 3 were significantly lower than those in group 1, respectively ( $p < 0.05$ , Table 1). Those parameters in group 2 were significantly lower than those in groups 3 ( $p < 0.05$ , Table 1). Mean CSA of GCM type 1 muscle fibres and PCNA or BrdU ratio in group 2 and 3 were significantly greater than those in group 1, respectively ( $p < 0.05$ , Table 2, Figure 1). Those parameters in group 2 were significantly greater than those in groups 3 ( $p < 0.05$ , Table 2, Figure 1).

#### **Conclusion**

The Results showed that low-intensity MT promotes regeneration in atrophied GCM muscle more effectively than high-intensity MT.

**Table 1.** Comparison of Clinical Parameters among Three Groups

	Atrophic change (%)		
	Rt. calf muscle circumference	CMAP on Rt. tibial nerve	Rt. GCM muscle thickness on US
Group 1 (n=5) (2W IC + 2W sham MT)	33.68 ± 1.09 <sup>a)</sup>	30.90 ± 1.01 <sup>a)</sup>	32.98 ± 1.44 <sup>a)</sup>
Group 2 (n=5) (2W IC + 2W MT 25µA)	15.28 ± 1.55 <sup>b)</sup>	13.40 ± 0.45 <sup>b)</sup>	13.30 ± 0.43 <sup>b)</sup>
Group 3 (n=5) (2W IC + 2W MT 5000µA)	18.16 ± 0.40 <sup>c)</sup>	14.10 ± 0.27 <sup>c)</sup>	14.10 ± 0.59 <sup>c)</sup>

Values are presented mean ± standard error

Group 1: IC for 2 weeks and sham MT for 2 weeks after CR; Group 2: IC for 2 weeks and MT (25 µA) for 2 weeks after CR; Group 3: IC for 2 weeks and MT (5000 µA) for 2 weeks after CR; IC, immobilization by cast; MT, microcurrent therapy; CR, cast removal, CMAP, compound muscle action potential, GCM, gastrocnemius muscle; US, ultrasound

Any two means in the same row with different letters represent a significant difference at  $p < 0.05$ , One Way ANOVA, post-hoc Tukey test.

**Table 2.** Comparison of Cross Sectional Area among Three Groups

	Cross Sectional Area (µm <sup>2</sup> )	
	Rt. GCM type 1	
	Medial	Lateral
Group 1 (n=5) (2W IC + 2W sham MT)	260.46 ± 17.86 <sup>a)</sup>	262.51 ± 14.31 <sup>a)</sup>
Group 2 (n=5) (2W IC + 2W MT 25µA)	822.37 ± 19.76 <sup>b)</sup>	870.43 ± 21.57 <sup>b)</sup>
Group 3 (n=5) (2W IC + 2W MT 5000µA)	675.11 ± 16.91 <sup>c)</sup>	684.06 ± 32.80 <sup>c)</sup>

Values are presented mean ± standard error

Group 1: IC for 2 weeks and sham MT for 2 weeks after CR; Group 2: IC for 2 weeks and MT (25 µA) for 2 weeks after CR; Group 3: IC for 2 weeks and MT (5000 µA) for 2 weeks after CR; IC, immobilization by cast; MT, microcurrent therapy; CR, cast removal, CMAP, compound muscle action potential, GCM, gastrocnemius muscle; US, ultrasound

Any two means in the same row with different letters represent a significant difference at  $p < 0.05$ , One Way ANOVA, post-hoc Tukey test.

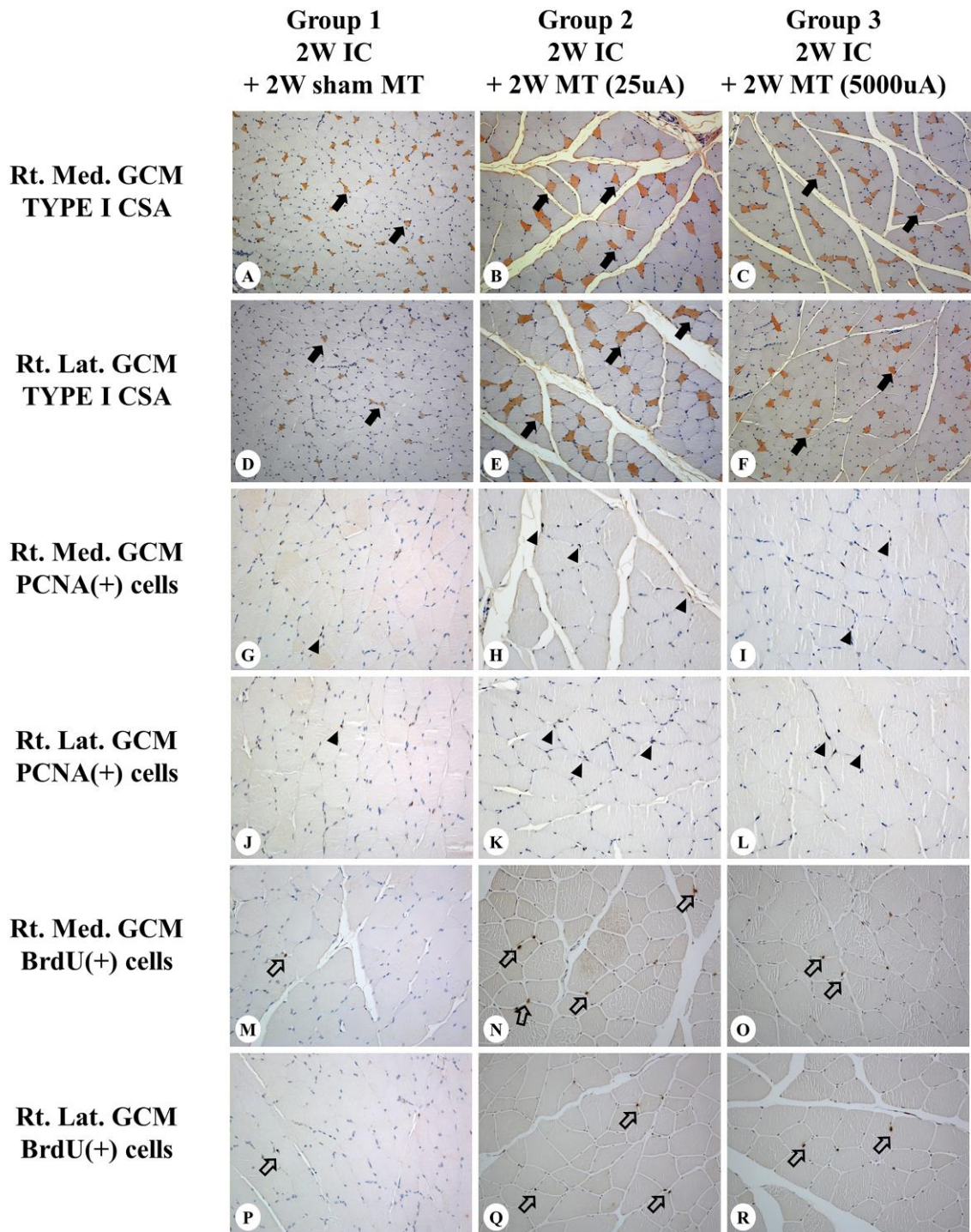


Figure 1. Immunohistochemical findings of the right medial and lateral gastrocnemius muscles in groups 1 - 3. (A, B, C, D, E, F) Cross sectional areas of right medial and lateral gastrocnemius type I muscle fibres [Monoclonal anti-myosin (skeletal, slow) antibody stain; x 100, arrows] were increased after microcurrent therapy. (G, H, I, J, K, L) PCNA positive cells were seen in right medial and lateral gastrocnemius muscle fibres (arrow heads). PCNA positive cells or nuclei were more increased in group 2 than group 1 and 3. (M, N, O, P, Q, R) BrdU positive cells were seen in right medial and lateral gastrocnemius muscle fibres (open arrows). The number of BrdU labelled cells or nuclei were increased after microcurrent therapy.