Cross Training with Neuromuscular Electrical Stimulation Improves Pain, Strength, and Muscle Thickness of Shoulder in Individuals with Acute Rotator Cuff Repair

Sieun Ko[1], Jihye Jung[1], Wonjae Choi[1], Seungwon Lee[2,*]

[1]Department of Physical Therpy, The Graduate School of Sahmyook University, Seoul, Republic of Korea

[2]Department of Physical Therpy, Sahmyook University, Seoul, Republic of Korea

[*]Corresponding author's e-mail: swlee@syu.ac.kr

BACKGROUND

Shoulder immobilization is commonly used to protect healing tissues after surgical repair of rotator cuff. However, immobilization may be caused loss of function is related to muscle weakness and imbalance in rotator cuff strength, particularly of the external rotators. Early rehabilitation is helpful for these adverse effects of immobilization. Neuromuscular electrical stimulation (NMES) has been shown to be an effective adjunct in the enhancement of muscle recruitment. Unilateral training will have an influence on the untrained side by cross training effect.

OBJECTIVES

This study was to investigate the effects of cross training with NMES on pain, strength, and muscle thickness of shoulder in acute rotator cuff repair.

SUBJECTS

Fourteen participants (8 men, 6 women) who underwent rotator cuff repair surgery within 4 weeks were enrolled in this study (Table 1).

Table 1. The General characteristics of subjects

	Subjects
Gender (male/female)	8 / 6
Tear type (full/partial)	1 / 13
Age (years)	54.6(2.41)
Height (cm)	164.29(1.96)
Weight (kg)	66.79(3.05)

Note. Values are expressed as mean(SD).

METHODS

Design o f this study was cross-sectional study.

Participants were received NMES during isometric contraction of the external rotators on affected side (Figure 1) and conducted contralateral cross training on upper extremity by using FLEXI-BAR® (Figure 2).

Pain pressure threshold for pain, manual muscle test for muscle strength, and muscle thickness with relaxed and contracted conditions on immobilized shoulder were examined pre and post interventions.

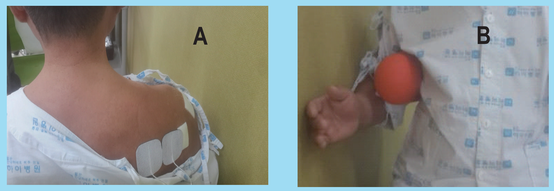

Figure 1. NMES during isometric contraction of the external rotators on affected side. (A) Placement of NMES pads, (B) Isometric exercise by using wall.

Figure 2. Contralateral cross training by using FLEXI-BAR®.

ANALYSIS

Paired Samples t-test was used to determine statistical significance of differences ($p<.05$) before and after intervention.

RESULTS

After intervention, pain pressure threshold, manual muscle test, and muscle thickness of infraspinatus were improved in all participants significantly ($p<.05$)(Table 2).

Table 2. Outcomes of immobilized shoulder

	Pre-test	Post-test	Change	t(p)
Pain Pressure Threshold (N)	49.29(15.12)	60.96(12.61)	11.67(14.61)	2.99(.010)
Manual muscle test (N)	2.80(0.89)	4.15(1.32)	1.35(1.09)	4.64(.000)
Infraspinatus muscle thickness				
Relaxed	2.80(0.33)	2.98(0.31)	0.18(0.14)	4.97(.000)
Contracted	3.00(0.30)	3.26(0.30)	0.27(0.17)	5.75(.000)

Note. Values are expressed as mean(SD).

CONCLUSION

We suggest that early rehabilitation of immobilized shoulder musculature could potentially be safely achieved by performing specific cross training. NMES may be used concomitantly with training to prevent the muscle atrophy and minimize the pain on the acute rotator cuff repair after surgery.

References

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