Relation of Respiratory Muscle Strength, Skeletal Muscle Index, Hand Grip Strength in Breast cancer

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Objective

The purpose of this study was to identify the relationship between respiratory muscle strength and skeletal muscle index and hand grip strength in breast cancer patients.

Method

This study was conducted on patients who visited the Rehabilitation medicine department for rehabilitation treatment from February 2019 to November 2022 after breast cancer surgery. A total of 52 patients were registered. Their muscle mass and body mass index (BMI) was measured through Bioelectrical Impedence Analysis (BIA) tests after breast cancer surgery. The muscle mass of both arms and legs were added to obtain an Appendicular Skeletal Muscle mass (ASM), and an Skeletal muscle mass index (SMI) was obtained by dividing the ASM by the square of the height. In addition, the hand grip power was measured using a dynamometer, and respiratory muscle strength such as maximal inspiratory pressure (MIP) and maximal expiratory pressure (MEP) were measured using a digital spirometer. The definition of sarcopenia was defined when muscle mass decreased and muscle function decreased, that is, muscle strength decreased or performance decreased.

Result

52 breast cancer patients belonged to this study (Table 1). The average age of the participants was 67.23±5.38. Both MIP and MEP showed positive correlations with ASM (r=0.371 and r=0.369, respectively, p<0.01 in both) and SMI (r=0.391, p<0.01 and r=0.321, p<0.05, respectively). In addition, HGS showed significant correlations in both MIP and MEPs (r=0.398 and r=0.384, respectively, p<0.01 in both) (Table 2). In the multiple regression analysis, MIP was significantly associated with Age, BMI, HGS, ASM, SMI (p<0.01 in all). In addition, MEP was significantly associated with Age, HGS, ASM (p<0.01 in all) and BMI, SMI (p<0.05 in all) (Table 3).

Table 1. Participant characteristics (N=52)

Dermographic factor	Value
Age (mean, year)	67.23 ± 5.38
Body mass index (kg/m²)	25.51 ± 3.64
Limb muscle strength	
Hand grip strength (kg)	16.71 ± 5.43
Skeletal muscle mass	
Appendicular skeletal muscle mass (kg)	15.33 ± 2.53
Skeletal mass index (%)	6.41 ± 0.80
Respiratory muscle strength	
Maximal inspiratory pressure (cmH2O)	62.56 ± 21.27
Maximal expiratory pressure (cmH2O)	62.62 ± 14.32

Values are presented as mean±standard deviation or number

Figure 1. Hand grip power measurement by Dynamometer

Figure 2. Respiratory muscle strength measurement by Spirometer

Table 2. Pearson correlation coefficients(r) of respiratory muscle strength, hand grip strength, and skeletal muscle mass

Variables	MIP		MEP	
	r	p-value	r	p-value
Age	-.367**	.007	-.416**	.002
BMI	.423**	.001	.268	.055
HGS	.398**	.003	.384**	.005
ASM	.371**	.007	.369**	.007
SMI	.391**	.004	.321*	.020

BMI, body mass index; HGS, hand grip strength; ASM, Appendicular skeletal muscle mass; SMI, Skeletal mass index; MIP, maximal inspiratory pressure; MEP, maximal expiratory pressure.
*p<0.05, **p<0.01.

Table 3. Multiple linear regression analysis for respiratory muscle strength using sarcopenic indices

Variables	MIP			MEP		
	SE	β	p-value	SE	β	p-value
Age	.570	-.505	.004**	.401	-.573	.001**
BMI	.965	1.828	.001**	.679	.404	.027*
HGS	.521	1.192	.002**	.366	.652	.002**
ASM	2.613	-.334	.003**	1.838	1.430	.004**
SMI	8.798	2.970	.002**	6.188	-1.836	.010*

BMI, body mass index; HGS, hand grip strength; ASM, Appendicular skeletal muscle mass; SMI, Skeletal mass index; MIP, maximal inspiratory pressure; MEP, maximal expiratory pressure; SE, standard error; β, standardized coefficient.
*p<0.05, **p<0.01.

Conclusion

This study shows that there is a significant relationship between respiratory muscle strength and skeletal muscle index in elderly breast cancer patients. Both MIP and MEP were significantly related to HGS, which shows that respiratory muscles have an important relationship with limb muscle strength. It is possible to predict sarcopenia by measuring respiratory muscle strength in elderly breast cancer patients, and it is necessary to apply active muscle exercise and nutritional intervention to prevent sarcopenia to patients with decreased respiratory muscle strength.