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Factors associated with prolonged recovery of shoulder range of motion after breast cancer surgery

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Background and Objective

Breast cancer is one of the most common types of cancer in women and surgical treatments including lumpectomy, mastectomy, and breast reconstructive surgery are commonly performed. Limited range of motion (ROM) of the affected shoulder frequently occurs after the breast cancer surgery, and it results in reduced quality of life. Although physical exercise is known to be effective in improving shoulder ROM, the factors associated with prolonged recovery of shoulder ROM are yet to be further investigated. Therefore, this study aimed to explore the factors associated with the prolonged recovery in shoulder ROM in postoperative breast cancer patients.

Method

This retrospective case-control study involved patients aged 20-70 years who were diagnosed with breast cancer and received axillary lymph node dissection or breast reconstruction following mastectomy. Those with limited ROM of the affected shoulder (flexion or abduction <160°) within 8 weeks after the operation were included. All participants performed the exercise for 8 weeks, and follow-up shoulder ROM was evaluated at 12-weeks from the enrollment. Univariable and multivariable logistic regression were used to evaluate the factors affecting limited ROM (flexion or abduction <160°) at 12-weeks from enrollment.

Result

Among 60 participants, 2 dropped out and total 58 participants were available for final analysis. Despite the exercise, 14 participants had persistently restricted ROM, and baseline characteristics are shown in Table 1. Multivariable analysis showed that reconstruction surgery during exercise and reduced initial passive shoulder flexion attributed to restricted shoulder flexion at 12-weeks follow-up, and reconstruction surgery during exercise and reduced initial passive shoulder abduction attributed to restricted shoulder abduction at 12-weeks follow up (Table 2). The cutoff value for predicting limited shoulder ROM at the 12-week follow-up was 115° for initial shoulder flexion, and 110° for initial shoulder abduction, according to the receiver operating characteristic curve (Figure 1).

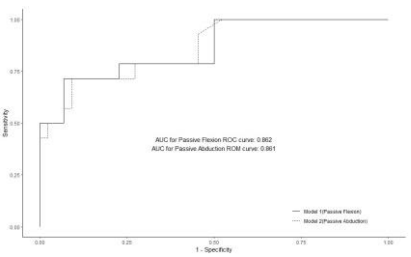
Table 1.
Baseline characteristics of the participants.

	No limitation (N=44)	Limitation (Flex or Abd <160) (N=14)	P-value
Age (years)	45.3 ± 8.5	49.3 ± 7.6	0.122
BMI (kg/m2)	22.5 ± 3.1	22.3 ± 2.9	0.849
Reconstruction surgery during exercise (yes)	5 (11.4%)	6 (42.9%)	**0.026***
Neoadjuvant CTx (yes)	7 (15.9%)	1 (7.1%)	0.701
Adjuvant CTx (yes)	25 (56.8%)	6 (42.9%)	0.545
HTx (yes)	22 (50.0%)	7 (50.0%)	1
RTx (yes)	8 (18.2%)	2 (14.3%)	1
Lymphedema (yes)	2 (4.5%)	1 (7.1%)	1
From Operation to Enroll (days)	23.4 ± 9.7	29.4 ± 12.3	0.064
Reconstruction (yes)	38 (86.4%)	14 (100.0%)	0.339
ALD (yes)	16 (36.4%)	8 (57.1%)	0.288
OP at dominant side (yes)	24 (54.5%)	6 (42.9%)	0.649
Initial passive flexion (°)	127.9 ± 23.5	106.8 ± 14.0	**<0.001***
Initial passive abduction (°)	116.5 ± 22.3	95.7 ± 16.2	**0.002***
Initial passive internal rotation (°)	80.8 ± 14.0	67.1 ± 20.2	**0.006***
Initial passive external rotation (°)	87.0 ± 7.3	77.5 ± 17.0	0.059
Initial DASH	42.6 ± 16.4	45.3 ± 20.2	0.617
Initial NRS (General)	0.4 ± 0.8	1.1 ± 1.8	0.222
Initial NRS (Maximal)	3.1 ± 1.9	3.9 ± 2.5	0.216
Initial EQ5D	0.7 ± 0.1	0.7 ± 0.2	0.775
Initial FACT B	93.8 ± 19.1	92.0 ± 24.0	0.778
Exercise Days	40.4 ± 14.0	38.4 ± 14.4	0.638

Table 2.
Univariable and multivariable analysis for prolonged recovery of shoulder range of motion.

	Univariable analysis		Multivariable analysis			
			Model 1 with Flexion		Model 2 with Abduction	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Age (years)	1.065 (0.987-1.163)	0.126				
BMI (kg/m2)	0.98 (0.784-1.196)	0.846				
Reconstruction surgery during exercise (yes)	5.85 (1.443 – 25.353)	**0.014***	12.753 (2.010-122.058)	**0.012***	9.855 (1.660-79.607)	**0.017***
Neoadjuvant CTx (yes)	0.407 (0.021-2.608)	0.420				
Adjuvant CTx (yes)	0.57 (0.162-1.911)	0.365				
HTx (yes)	1.00 (0.295-3.386)	1.000				
RTx (yes)	0.75 (0.104-5.528)	0.737				
Lymphedema (yes)	1.615 (0.072-18.228)	0.705				
From Operation to Enroll (days)	1.053 (0.996-1.118)	0.075				
ALD (yes)	2.333 (0.692-8.274)	0.175				
OP at dominant side (yes)	0.625 (0.178-2.093)	0.448				
Initial passive flexion (°)	0.955 (0.919-0.984)	**0.007***	0.942 (0.893-0.980)	**0.01***		
Initial passive abduction (°)	0.948 (0.908-0.981)	**0.006***			0.943 (0.892-0.984)	**0.017***
Initial passive internal rotation (°)	0.954 (0.918-0.989)	**0.013***	0.967 (0.912-1.021)	0.932	0.976 (0.925-1.028)	0.3475
Initial passive external rotation (°)	0.934 (0.879-0.983)	**0.014***	0.972 (0.895-1.049)	0.220	0.967 (0.892-1.044)	0.3864
Initial DASH	1.009 (0.974-1.046)	0.610				
Initial NRS (General)	1.525 (0.939-2.608)	0.092				
Initial NRS (Maximal)	1.203 (0.899-1.632)	0.216				
Initial EQ5D	0.541 (0.01-47.477)	0.771				
Initial FACT B	0.996 (0.996-1.026)	0.773				
Exercise Days	0.99 (0.95-1.035)	0.631				

Figure 1.
Receiver operating characteristic curve for predicting prolonged recovery of shoulder range of motion.



Conclusion

More care needs to be taken when prescribing physical therapy to breast cancer patients who underwent reconstruction surgery during exercise and whose initial postoperative shoulder range of motion (ROM) is less than 115° for flexion and 110° for abduction.

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