Original Article

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Turkish Translation, Cross-Cultural Adaptation and Psychometric Evaluation of the Tool of Myofascial Adhesions in Patients After Breast Cancer

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ABSTRACT

Objective: Myofascial adhesions are an important cause of upper extremity dysfunction among breast cancer surgery (BCS) patients. Myofascial-adhesions-in-patients-after-breast-cancer (MAP-BC) is a quantitative method developed to assess scar tissue and adhesions. This study aims to create a Turkish version of the MAP-BC tool and to test its validity and reliability.

Materials and Methods: This cross-cultural adaptation and validation study included 81 female BCS patients aged 18–80 years. For convergent validity, patients were assessed using MAP-BC and the Patient and Observer Scar Assessment Scale observer subscale. For test-retest reliability, the patients were assessed on days 0 and 14. Thirty-two patients were evaluated by a second researcher to assess interrater reliability.

Results: Validity was fair to good (rho = 0.631). For test-retest reliability, intraclass correlation (ICC) values for the subgroups ranged from 0.798 to 0.954, with an ICC = 0.948 for the total score, indicating good-to-excellent test–retest reliability. Interrater ICC values ranged from 0.417 to 0.949, with ICC = 0.938 for the total score, suggesting good to excellent interrater agreement, except for the "frontal chest wall" section.

Conclusion: The Turkish MAP-BC tool is valid and reliable for evaluating myofascial adhesions and scars after BCS and adjuvant treatments. Clinicians are encouraged to use MAP-BC to detect myofascial adhesions and evaluate treatment efficacy, as this is the first tool available in Turkish for this purpose.

Keywords: Breast cancer; myofascial adhesion; myofascial dysfunction; scar tissue

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Key Points

- Myofascial adhesions are an important yet often overlooked cause of upper extremity dysfunction in breast cancer survivors.
- Myofascial Adhesions in Patients after Breast Cancer (MAP-BC) is a valid and reliable evaluation method for detecting myofascial adhesions and assessing scar tissue after BCS and adjuvant treatments.
- The availability of a reliable and valid tool enables the detection and early treatment of myofascial adhesions in breast cancer survivors, contributing to improved rehabilitation outcomes and quantitative monitoring of tissue recovery.
- The Turkish form of the MAP-BC tool is found to be valid and reliable, and clinicians are encouraged to use MAP-BC to detect myofascial adhesions and evaluate treatment efficacy.

Introduction

Breast cancer (BC) is the most commonly diagnosed malignancy worldwide, accounting for 11.7% of all cases (1). With current screening methods, early diagnosis is achievable, and advances in treatment approaches have led to steadily increasing survival rates. Therefore, understanding and managing the long-term effects of cancer treatments has become increasingly important as the population of BC survivors grows (2).

The International Consortium for Health Outcomes Measurement defines upper extremity function as one of the most important health outcomes for women with BC (3). As a result of axillary and breast surgery, radiotherapy, hormone therapy, and chemotherapy, patients may develop upper extremity dysfunction (UED) and pain, leading to limitations in daily activities and reduced quality of life (4-7). The primary factors affecting upper extremity function in patients with BC include lymphedema, severe pain, limited shoulder range of motion,

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diminished muscle strength, axillary web syndrome, myofascial trigger points, and myofascial adhesions (8).

Mastectomy, breast-conserving surgery, axillary lymph node dissection, sentinel lymph node biopsy, and radiotherapy have notable effects on the skin, muscle, and fascial tissues of the chest wall and upper extremity, leading to myofascial dysfunction (9). Myofascial dysfunction is characterized by trigger points, adhesions, and restricted mobility and impaired gliding of myofascial tissues over one another (10, 11). Manipulation of the muscles during surgery, scar tissue formation, soft tissue adhesions, development of an adaptive posture following surgery, and radiation-induced fibrosis can lead to myofascial adhesions (10, 12). Myofascial release techniques may be used in the treatment (10, 13, 14).

Commonly used criteria exist for the diagnosis of myofascial trigger points (15). However, there are gaps in both the literature and daily clinical practice regarding the assessment of scar tissue and adhesions. Fourie (13) evaluated the presence of myofascial adhesions by palpating restrictions in tissue gliding; however, they did not develop a quantitative assessment method. A diagnostic tool named myofascial adhesions in patients (MAP) after BC was developed by De Groef et al. (9) to evaluate myofascial adhesions and was shown to be a reliable and valid assessment method.

The identification, quantitative measurement, and scoring of myofascial adhesions in BC patients with UED are of great importance for both planning targeted interventions and evaluating the effectiveness of treatments, such as myofascial and physical therapy modalities. In the long term, this would not only enhance physical functioning but also improve quality of life among BC survivors. According to the literature review, no Turkish translation, cultural adaptation, or study of the validity and reliability of the MAP-BC assessment tool has been conducted in the Turkish population. The aim of this study is to develop the Turkish version of the MAP-BC and to assess its validity and reliability in women who have undergone BC treatment.

Materials and Methods

Study Design

This is a cross-cultural adaptation, validation, and reliability study of the MAP-BC Turkish version. The study was approved by the University of Health Sciences Türkiye, Hamidiye Scientific Research Ethics Committee (approval number: 23/337, date: 26.05.2023) and was registered in the ClinicalTrials.gov database (ID: NCT05923164, registration date: 16/08/2023). Written and oral consent was obtained from all participants, and the research was conducted in accordance with the Declaration of Helsinki.

Development of the Turkish Version of the MAP-BC: Translation and Cross-Cultural Adaptation

The translation and cross-cultural adaptation were carried out in accordance with the international guidelines (16, 17). One of the researchers contacted the developer of the MAP-BC tool (Lore Dams) and obtained consent to translate and use the assessment tool.

First, the original version of MAP-BC was translated into Turkish, and two separate forms were created by two translators who were native Turkish speakers and fluent in English. These two researchers collaborated to resolve discrepancies, producing a single Turkish version. This initial Turkish version of the tool was then back-translated into English by a translator who was a native English speaker, fluent in Turkish, and unfamiliar with the original form. Finally, a committee consisting of two translators and four expert physiatrists compared the original and translated versions of the MAP-BC in terms of semantic and conceptual equivalence and finalized the Turkish version. Two researchers assessed pilot testing involving 15 patients and addressed the results, challenges, and experiences (18).

Assessment of Convergent Validity, Test-Retest and Interrater Reliability

A total of 81 female patients, aged between 18 and 80 years, who had undergone BC surgery, who had applied to the Physical Medicine and Rehabilitation oncology rehabilitation subspecialty outpatient clinic, and who had given oral and written consent were included in the study. Patients who did not give consent, who were illiterate, or who had active skin disease or infection that may prevent palpation-based examination were excluded from the study.

Power Analysis: For patient allocation, the sample size was determined using the commonly applied rule of thumb in psychometric evaluation studies, which recommends at least 10 participants per item (19). A sample size of ten participants was calculated for each of the eight parameters of the MAP-BC tool. To account for a 10% potential dropout rate, it was deemed appropriate to include 88 patients.

Convergent Validity: The convergent validity of the Turkish version of MAP-BC was assessed by analyzing correlations with the observer subscale of the Turkish version of the patient and observer scar assessment scale (POSAS) (20, 21).

Test-Retest Reliability: All participants were evaluated twice by the same researcher, 14 days apart, and the assessments were recorded as T0 and T1. No interventions or treatments were given during this period.

Interrater Reliability: Thirty-two patients were independently evaluated by two researchers using the MAP-BC form; the researchers were unaware of one another's results.

POSAS: This assessment tool consists of two separate scales, one evaluated by the observer and one by the patient, and its validity and reliability for detecting scar tissue in patients who have undergone BC surgery have been established (20, 21). The observer subscale rates five variables—vascularity, pigmentation, thickness, surface pliability, and elasticity—on a scale from 1 to 10 (with 1 indicating normal skin), with the total score ranging from 5 to 50. The validated Turkish version of the observer subscale of the POSAS was used to assess convergent validity in this study (22).

MAP-BC: This assessment method was developed to evaluate scar tissue and to quantitatively measure myofascial adhesions following BC treatment (9, 23). The degree of adhesion is scored using a 4-point scale (0: no adhesion – 3: very severe adhesion) at three tissue-depth levels (skin, superficial, deep) in each of seven areas: axillary scar, breast/mastectomy scar, pectoral region, anterior pectoral wall, lateral pectoral wall, axilla, and inframammary fold. The total score is calculated by summing the scores from all three levels in each region, with a maximum possible score of 63. The interrater reliability of palpation-based assessment of myofascial adhesions in BC patients has been reported to be good to excellent (9).

Statistical Analysis

Statistical analyses were conducted using SPSS v22 (IBM Corp., Armonk, NY, USA). Normality of the data distribution was assessed using the Shapiro-Wilk test. For validity assessment, Spearman correlation coefficients were interpreted as very weak (0.00–0.19), weak (0.20–0.39), moderate (0.40–0.59), strong (0.60–0.79), and very strong (0.80–1.00). To calculate the test-retest and interrater reliability, the intraclass correlation (ICC) for single measurements [ICC (2.1)], based on a two-way random-effects analysis of variance (ANOVA) model, was applied to the total score for each area and its subscores (skin, superficial, and deep). The ICC values for test-retest and interrater measurements were interpreted as indicating poor (<0.50), moderate (0.50–0.74), good (0.75–0.89), or excellent (≥0.90) reliability. For all analyses, statistical significance was set at $p<0.05$ (corresponding to a 95% confidence level).

Results

During the translation and cross-cultural adaptation process, several changes were made to increase clarity. The word "therapist" was replaced with "examiner" to represent both physiotherapists and clinicians that are expected to use the tool. The word "gliding" was replaced with "mobility" to maintain the semantic integrity of the instructions in Turkish. The pilot testing of the final version concluded with no disagreements regarding semantics, understandability, or methodological challenges. The final Turkish version of the form is provided in the Supplementary Figure 1.

A total of 88 patients were included in the study. Two patients were excluded due to breast implant surgery. One patient was excluded due to a localized, active fungal infection in the inframammary fold. Four patients discontinued participation before the second (T1) evaluation. The study included 81 patients whose results were analyzed. The flowchart of the study is shown in Figure 1. The sociodemographic characteristics of the patients are provided in Table 1.

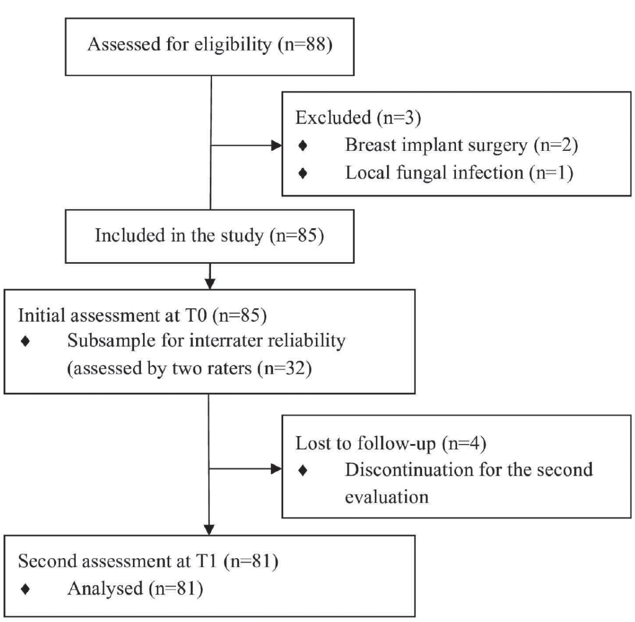

Figure 1. The flowchart of the study

Convergent Validity

The validity of the MAP-BC tool, calculated by comparing the total scores of MAP-BC and POSAS, was found to be moderate-to-strong (rho = 0.631, $p<0.001$).

Test-Retest Reliability

ICC values for subgroups and the total score, calculated for test-retest reliability ranged from 0.798 to 0.954. The ICC for the total score was 0.947 [95% confidence interval (CI), 0.919–0.966], indicating good to excellent test-retest reliability of the questionnaire (Table 2). The test-retest reliability for each region and examination level (skin, superficial, and deep) is presented in the Appendix (Supplementary Table 1).

Interrater Reliability

Interrater ICC values ranged from 0.405 to 0.948; the total-score interrater ICC was 0.937 (95% CI: 0.874–0.969). This suggests good to excellent interrater agreement, except for the "frontal chest wall" subsection (Table 3). The interrater agreement scores for each depth level of the regions are given in the Appendix (Supplementary Table 2).

Discussion and Conclusion

Myofascial adhesions are recognized as significant factors that can affect quality of life and contribute to UED in patients with BC (10, 11). Myofascial release techniques and manual therapy may be used in the treatment of these adhesions; however, there is a need for quantitative assessment tools to support diagnosis and monitor treatment outcomes (13, 14). The MAP-BC was developed as an evaluation instrument for this purpose. The test is equipment-free, requires approximately 15 minutes to complete, and evaluators found the Turkish version easy to apply. This study revealed moderate to strong validity, good to excellent test-retest reliability, and good to excellent interrater agreement for the Turkish version of the MAP-BC tool.

This study found moderate-to-strong validity of the MAP-BC compared with the POSAS tool. The developers of the tool reported moderate validity (23). However, it is noteworthy that in that study the comparative tool was a cutometer, which evaluated only the mastectomy scar. In the Spanish validity study, correlations between MAP-BC and POSAS were found to be moderate at T1, consistent with the results of this study (18). To date, no gold-standard method exists for evaluating myofascial adhesions. POSAS evaluates scar tissue across multiple components, in addition to elasticity, including surface area, pigmentation, vascularity, and thickness, which may account for its relatively limited validity.

The test-retest reliability was good to excellent in all areas. Since test–retest reliability has not been assessed by the original developers or in any prior translation and cultural adaptation studies, it is not possible to interpret the findings within this context.

This study found good to excellent interrater agreement regarding the total scores. Although the overall interrater reliability was not mentioned in the developers' article, they found good interrater agreement for axillary scars (0.82) and excellent agreement for breast (0.99) and mastectomy (0.96) scars (9). Similarly, this study revealed good to excellent interrater agreement for scar tissue: 0.829 for axillary scar, 0.907 for breast scar, and 0.948 for mastectomy scar. It is a well-established fact that the frequency of breast implant surgeries has been increasing over time. Although patients with breast implants were

Table 1. The sociodemographic data of the patients

Age mean (SD) (min-max)		56.85 (11.19) (33–80)
BMI mean (SD) median (Q1; Q3)		28.73 (4.76) 28 (25.43; 32.22)
Occupation n (%)	Homemaker	54 (66.7%)
	Civil servant	11 (13.6%)
	Retired	11 (13.6%)
	Self-employed	5 (6.2%)
Educational status n (%)	Primary	37 (45.7%)
	Elementary	10 (12.3%)
	Highschool	24 (29.6%)
	University	10 (12.3%)
Smoking n (%)	Yes	12 (14.8%)
	No	69 (85.2%)
Physical activity n (%)	Sedentary	1 (1.2%)
	Walks for pleasure	42 (51.9%)
	Regular activity	26 (32.1%)
	Sportive activity	12 (14.8)
Alcohol intake n (%)	Yes	12 (14.8%)
	No	69 (85.2%)
Pack years of smoking mean (SD) (min-max)		4.56 (11.64) (0–5)
Breast cancer diagnosis yrs. mean (SD) (min-max)		6.01 (5.51) (0.50–22)
Surgery n (%)	Breast conservative surgery	42 (51.9%)
	Mastectomy	39 (48.1%)
Lymph node dissection n (%)	Yes	45 (55.6%)
	No	36 (44.4%)
Metastasis n (%)	Yes	21 (25.9%)
	No	60 (74.1%)
Radiotherapy n (%)	Yes	66 (81.5%)
	No	15 (18.5%)
Hormonetherapy n (%)	Yes	63 (77.8%)
	No	18 (22.2 %)
Lymphedema duration mean (SD) (min-max)		1.65 (2.42) (0–10)
Lymphedema stage n (%)	Stage 0/No clinical lymphedema*	41 (50.6%)
	Stage 1	23 (28.4%)
	Stage 2	14 (17.3%)
	Stage 3	3 (3.7 %)

n: number of patients; SD: Standard deviation; min: Minimum; Max: Maximum

*It is well established that microscopic changes occur in the lymphatic system of patients who have undergone breast cancer treatment, conferring a lifelong risk of clinical lymphedema. To emphasize this, patients with no clinical symptoms were graded as stage 0/no clinical lymphedema.

Table 2. Test-retest reliability analysis

Location	First evaluation Median (Q1; Q3)	Second evaluation Median (Q1; Q3)	ICC (95% CI)
Axillary scar (*n* = 69)	3.0 (2.0; 5.0)	4.0 (2.0; 5.0)	0.839 (0.752–0.897)
Breast scar (*n* = 40)	5.5 (3.0; 6.0)	5.0 (4.0; 6.0)	0.929 (0.871–0.962)
Mastectomy scar (*n* = 41)	6.0 (4.0; 7.0)	6.0 (3.0; 6.0)	0.954 (0.915–0.975)
Mm pectorales region (*n* = 81)	0.0 (0.0; 1.0)	0.0 (0.0; 2.0)	0.883 (0.824–0.923)
Frontal chest wall (*n* = 81)	0.0 (0.0; 1.0)	0.0 (0.0; 1.0)	0.798 (0.702-0.865)
Lateral chest wall (*n* = 81)	0.0 (0.0; 1.0)	0.0 (0.0; 1.0)	0.847 (0.771–0.899)
Axilla (*n* = 81)	2.0 (0.0; 3.0)	2.0 (0.0; 3.0)	0.888 (0.831–0.926)
Inframammary fold (*n* = 81)	1.0 (0.0; 3.0)	0.0 (0.0; 2.0)	0.890 (0.833–0.928)

The intraclass correlation coefficient was used in the analysis. CI: Confidence interval; ICC: Intraclass correlation coefficient; n: Number of patients, $p<0.05$ for all

Table 3. Interrater reliability analysis

Location	Rater 1 Median (Q1; Q3)	Rater 2 Median (Q1; Q3)	ICC (95% CI)
Axillary scar (*n* = 28)	4.0 (2.0; 5.25)	4.0 (3.0; 5.25)	0.829 (0.664–0.917)
Breast scar (*n* = 16)	6.0 (3.75; 6.0)	5.5 (3.75; 6.0)	0.907 (0.755–0.966)
Mastectomy scar (*n* = 15)	6.0 (3.5; 6.0)	6.0 (3.0; 6.5)	0.948 (0.854–0.982)
Mm pectorales region (*n* = 32)	0.0 (0.0; 0.25)	0.0 (0.0; 1.0)	0.870 (0.750–0.934)
Frontal chest wall (*n* = 31)	0.0 (0.0; 0.0)	0.0 (0.0; 0.0)	0.405 (0.065–0.661)
Lateral chest wall (*n* = 31)	0.0 (0.0; 2.0)	0.0 (0.0; 1.0)	0.621 (0.346–0.797)
Axilla (*n* = 31)	2.0 (0.5; 3.0)	2.0 (0.0; 3.0)	0.919 (0.838–0.960)
Inframammary fold (*n* = 32)	0.0 (0.0; 2.0)	0.5 (0.0; 2.0)	0.702 (0.471–0.842)

The intraclass correlation coefficient was used in the analysis. CI: Confidence interval; ICC: Intraclass correlation coefficient; n: Number of patients, $p<0.05$ for all

excluded from the present study, they may be considered a separate category in future studies.

Conversely, this study demonstrated lower interrater reliability in non-scar areas, except for the axillary and Mm pectorales regions, which showed good-to-excellent and good agreement, respectively. In the axillary area, the deep myofascial tissue level showed moderate reliability, as postsurgical alterations and radiation-induced fibrosis may complicate palpation and differentiation of tissue depth (9). The results for the pectoral region align with the previous study, although the deep tissue level was moderate in the current study (9). This can be attributed to postsurgical in the area, such as direct damage; development of myofascial trigger points resulting from pain, adaptive posture, and muscle shortening; and radiation fibrosis (24).

The frontal chest wall had poor-to-moderate reliability, whereas the lateral chest wall had moderate reliability, and the inframammary fold showed moderate-to-good reliability in this study. The developers found good agreement in all areas except for the inframammary fold, where agreement was moderate (9). Discriminating between the superficial and deep tissue levels in this region posed a challenge. This can be attributed to the absence of muscle in the frontal chest wall. As proposed by the developers, this site can be evaluated in two layers, skin and tissue, to increase reliability (9). Myofascial adhesions can develop in the lateral chest wall from drains placed at both the breast and axillary sites. Similar to the previous study, the lower reliability may be explained by the possible presence of two different drain scars (9). Adhesions in the inframammary fold may develop due to a drain or to the suture site, especially in the case of breast-conserving surgery. It may be difficult to differentiate depth levels or to distinguish normal tissue from adhesions, because the area may be naturally firm with reduced flexibility. The developers recommend that this area be evaluated at two levels, as with the frontal chest wall, which could increase interrater agreement in these regions (9). Overall, it is recommended to use total scores for the areas in clinical settings (9).

Study Limitations

This study has several limitations. First, a more precise method for measuring elasticity and tissue gliding, such as a Cutometer, may have been used to assess the validity of the tool. Second, there was no intervention during the study, so responsiveness could not be evaluated. Responsiveness may also be assessed in future studies through interventions such as physical therapy. In light of the increasing number of patients with breast implants, developing alternative evaluation methods or including an additional region in MAP-BC is recommended.

Several strengths can be highlighted in this study. First, a quantitative assessment method developed for evaluating scars and adhesions was translated into Turkish and culturally adapted to make it accessible to the target population. An additional strength of the study lies in its comprehensive evaluation of both validity and reliability, including inter-rater and test-retest analyses.

The Turkish form of MAP-BC is a valid and reliable tool for evaluating myofascial adhesions and scars after BC surgery and adjuvant treatments. Myofascial adhesions are an often-overlooked musculoskeletal problem in patients with BC and may result in additional pain, upper-extremity-related disability, and decreased quality of life if left untreated. Using such a rapid assessment tool may contribute to the diagnosis, early treatment, and quantitative evaluation of this condition during treatment follow-up. Clinicians are encouraged to use this tool for detecting myofascial adhesions and evaluating treatment efficacy, as this is the first tool in the Turkish language to evaluate myofascial adhesions after BC treatment.

Ethics

Ethics Committee Approval: The study was approved by the University of Health Sciences Türkiye, Hamidiye Scientific Research Ethics Committee (approval number: 23/337, date: 26.05.2023)

Informed Consent: Written and oral consent was obtained from all participants, and the research was conducted in accordance with the Declaration of Helsinki.

Footnotes

Authorship Contributions

Surgical and Medical Practices: G.Y., F.N.Y., Ö.T.; Concept: G.Y., Y.B.Ö., E.A.; Design: G.Y., F.N.Y., Y.B.Ö.; Data Collection or Processing: Ö.T.; Analysis or Interpretation: G.Y., F.N.Y., Ö.T., C.Ş.; Literature Search: G.Y., Y.B.Ö., E.A.; Writing: G.Y., F.N.Y., Ö.T., Y.B.Ö., C.Ş., E.A.

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