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A prospective case-control study of disability, quality of life, and functional impairment of shoulder movements after latissimus dorsi myocutaneous flap reconstruction in breast cancer patients

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ABSTRACT

Objective: Dysfunction of shoulder movements could be a limiting factor to the use of Latissimus dorsi (LD) flap. This study aimed to assess the impact of LD flap reconstruction on shoulder dysfunction and the quality of life.

Material and Methods: This study comprised 28 early breast cancer cases who underwent breast conserving surgery (BCS) with LD flap and 40 controls. Subjective and objective assessments were done a year later.

Results: Mild and moderate disability were found in 85.71% and 14.3% cases vs. 100% and 0% controls (p= 0.316) respectively. Physical and emotional functioning were 84.29 ± 5.61 and 66.67 ± 6.05 in cases vs. 86.67 ± 8.38 and 70.0 ± 6.84 in controls (p= 0.36, 0.23) respectively. Pain score in cases was 23.8 ± 15.6 vs. 12.17 ± 8.4 in controls (p= 0.018). LD muscle strength in extension was 4.39 ± 0.35 in cases vs. 4.88 ± 0.22 in controls (p< 0.001), 4.43 ± 0.18 for adduction in cases vs. 4.65 ± 0.24 in controls (p= 0.006). ROM of shoulder in flexion was 151.61 ± 4.86° in cases and 153.88 ± 2.36° in controls (p= 0.08), 40.36 ± 3.52° in cases vs. 49.13 ± 1.86° in controls for extension (p< 0.001), in abduction it was 150.54 ± 3.69° in cases vs. 150.00 ± 0.00° in controls (p= 0.518), in adduction was 30.89 ± 4.0° in cases vs. 38.13 ± 1.11° in controls (p< 0.001), in external rotation was 73.57 ± 3.63° in cases vs. 77.63 ± 2.36° in controls (p< 0.001), and internal rotation was 69.46 ± 3.56° in cases vs. 79.00 ± 1.26° in controls (p< 0.001).

Conclusion: We conclude that functional impairment should not be a determining factor for LD flap in breast reconstruction surgery.

Keywords: Latissimus dorsi, flap reconstruction, quality of life, shoulder dysfunction, breast conserving surgery

INTRODUCTION

A wide range of options are available for breast reconstruction after breast conserving surgery (BCS) and may include autogenous flaps like transversus rectus abdominis flap, latissimus dorsi (LD) flap, gluteal and thoraco-epigastric flap or alloplastic reconstructions including implants and combination procedures. LD flap is the most used and most versatile flap which can withstand radiation, can be mobilized to fill any quadrant of the breast and the technique is relatively easy to learn (1).

The LD muscle is primarily used in extension, adduction, and internal rotation. Routine activities like pulling a door, walking upstairs, getting up from sitting position with the help of arms are dependent on LD (2). The use of LD flap may impair the above-mentioned shoulder functions, which could be a limitation of its use in reconstruction surgery.

In this study, we evaluated the functional impairment after LD flap breast reconstruction on patient's shoulder movements and QOL using the disabilities of the arm, shoulder and hand (DASH) questionnaire and The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) questionnaire and assessed the range of motion of the shoulder and muscle strength as part of the objective assessment.

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MATERIAL and METHODS

This prospective case-control study was conducted in a tertiary care centre in India from September 2019 to August 2020. The study population consisted of 68 patients with early breast cancer (Stage I-IIIa) who underwent primary surgery. Twenty-eight patients who underwent BCS + LD flap reconstruction was enrolled as cases and 40 controls underwent BCS or modified radical mastectomy (MRM) without flap reconstruction. All patients in our study had undergone axillary dissection during the respective surgeries. Also, all patients went through a course of radiotherapy and chemotherapy post-surgery. Patients who received neoadjuvant chemotherapy with metastatic disease or pre-existing shoulder deformities were excluded.

Postoperatively, all patients (cases and controls) were advised arm strengthening by exercise and shoulder physiotherapy. The exercise schedule was set as follows, by the physical medicine and rehabilitation physician, as per institutional protocols:

Days 1-7 (immediately post-surgery): Deep breathing, pump it ups, shoulder shrugs and circles, shoulder blade squeeze, and arm lifts.

After drain removal till six weeks post-surgery: Wand exercises, winging, wall climbing, side bends, and snow angels.

After six weeks post-surgery (advance exercises): Strengthening exercises with light weights (500 g to 1 kg) and regular aerobic exercises.

A re-evaluation of cases and controls was done one year after the surgery.

QOL and subjective domains were assessed using DASH and the EORTC QOL-C30 questionnaire. The bilateral shoulders' range of motion (ROM) were assessed in six primary movements of LD viz. flexion, extension, abduction, adduction, external and internal rotation, which was done by physical medicine and rehabilitation specialists using goniometry and the Oxford scale.

The DASH questionnaire has been developed by the American Academy of Orthopaedic Surgeons in collaboration with other organisations (3). It includes thirty items to grade the functional impairment of upper limbs of patients. The first 21 items evaluate the patient's ability to perform certain activities, which come into use in daily living, in the preceding week. The next five items evaluate symptoms like pain, numbness and weakness, whereas the last four items evaluate the effect of pain and weakness on the patient's social activity. Dominance of the upper limb or the side affected in surgery does not alter the DASH score, because the upper limb works as a unit and the DASH is a functional measure of that working unit. It has been validated in multiple studies (4). Scoring of each question ranges from 1 to 5, where one represents no disability and five represents inability to perform the activity. The score is calculated by utilizing the DASH formula. Score of zero represents no functional impairment while a score of 100 represents very severe impairment.

DASH score is calculated using the following equation:

$$\text{DASH disability score} = \left[\frac{(\text{sum of n responses})}{\text{n}} - 1\right] \times 25$$

(Where, n= number of completed response)

These scores were then categorized into groups as:

- 0%- No disability
- 0-20%- Minimal disability
- 21-40%- Mild disability
- 41-60%- Moderate disability
- 61-80%- Severe disability
- 81-100%-Very severe disability

The EORTC (European Organization for Research and Treatment of Cancer) questionnaire is an organized and validated system for evaluating the health-related Quality of Life (QoL) of cancer patients (5). The EORTC QOL-C30 is composed of nine multi-item scales, which include five functional scales (physical, role, cognitive, emotional and social), three symptom scales (fatigue, pain and nausea or vomiting), a global Quality of Life (QoL) scale and six single-item measures. Every multi-item scale includes a different set of items, and no item occurs in more than one scale. All scales and single-item measures range in score from 0-100. A high scale score represents a higher response level. Thus a high score for a functional scale represents a high QoL. But a high score for a symptom scale or item represents a high level of symptomatology. Estimating the average of the items that contribute to the scale, will give us the raw score. Linear transformation is used to standardise the raw score, so that scores range from 0 to 100. A higher score represents a higher level of functioning or a higher level of symptoms.

The range of motion (ROM) of the shoulder joint was evaluated by goniometry with no passive support given to the arm. The endpoint of assessment of each shoulder movement was the point where pain or soft tissue tightness started and the patient was unable to move her shoulder. All these ROMs were compared with the normal reference ranges (as per the American Academy of Orthopedic Surgeons) (6).

Bilateral LD muscle strength at the shoulder joint was measured using the Oxford scale for all patients by evaluating extension and adduction (7). These movements involve grading the muscle strength at the shoulder joint, and the point where

compensatory movement of shoulder and/ or trunk occurred was considered as the endpoint.

Statistical Analysis

Data analysis was done using MS Excel (Microsoft Corporation, Seattle, WA) and SPSS v22 (IBM, USinc). Simple descriptive analysis was performed to express the data in terms of percentage and mean ± standard deviation. The groups (cases and controls) were compared using the unpaired t test (for parametric variables), and a p-value of <0.05 was considered significant.

All procedures were followed according to the ethical standards of human experimentation and the Helsinki declaration (rev. 2013). Ethics approval was obtained from the Institutional Ethics Committee.

RESULTS

In our study, mean age of the cases was 43.86 ± 7.82 years (range= 35-53 years), whereas that of the control was 47.85 ± 8.56 years (range= 35-64 years) (p= 0.176). Both cases and controls were matched for the stage of the disease, with stage II being the most common stage at presentation in both groups [26 cases (92.8%) vs. 26 controls (65%) (p= 0.23)] (Table 1).

On DASH scoring, the disability experienced by the cases and the controls was found to be comparable (p= 0.32). In cases, the disability scores varied from mild (85.71%) to moderate (14.79%) while all patients in the control group had mild disability scores. Absence of disability, minimal, severe or very severe disability score was not found in either of the groups (Table 2).

Table 1. TNM distribution (AJCC-7) of patients in case and control groups

		Case		Control		
Stage	**Grading**	**n**	**%**	**n**	**%**	**p-value**
0	TisN0M0	0	0.00	0	0.00	
IA	T1NOM0	0	0.00	2	5.00	0.380
IB	T0N1miM0	0	0.00	0	0.00	-
	T1N1miM0	0	0.00	0	0.00	
IIA	T0N1M0	0	0.00	2	5.00	0.380
	T1N1M0	0	0.00	2	5.00	0.380
	T2N0M0	6	20.00	10	25.00	0.727
IIB	T2N1M0	18	60.00	14	35.00	0.26
	T3N0M0	2	6.67	0	0.00	0.380
IIIA	T0N2M0	0	0.00	2	5.00	0.380
	T1N2M0	0	0.00	2	5.00	0.380
	T2N2M0	0	0.00	2	5.00	0.380
	T3N1M0	2	6.67	2	5.00	0.834
	T3N2M0	0	0.00	2	5.00	0.834
IIIB	T4NOM0	0	0.00	0	0.00	-
	T4N1M0	0	0.00	0	0.00	-
	T4N2M0	0	0.00	0	0.00	-

Table 2. Comparison of DASH score in the patients (cases vs control)

	Cases n= 14		Control n= 20		
Disability	**n**	**%**	**n**	**%**	**p-value**
No (0%)	0	0.00%	0	0.00%	0.316
Minimal (1-20%)	0	0.00%	0	0.00%	
Mild (21-40%	24	85.71%	40	100.00%	
Moderate (41-60%)	4	14.29%	0	0.00%	
Severe (61-80%)	0	0.00%	0	0.00%	
Very severe (81-100%)	0	0.00%	0	0.00%	

Using EORTC QLQ-C30, the mean global health score was 73.21 ± 9.90 in cases vs. 75.83 ± 10.4 in controls (p= 0.316).

Amongst various parameters of the functional domain, no role function showed a measurable difference between the two groups. Mean physical functioning/QoL was 84.29 ± 5.61 in cases vs. 86.67 ± 8.38 in control (p= 0.36). Mean role functioning/QoL in cases was 79.76 ± 14.88 and 86.67 ± 11.6 in controls (p= 0.14). Mean emotional functioning/QoL in cases was 66.67 ± 6.05 vs. 70.0 ± 6.84 in control (p= 0.24). Mean cognitive functioning/QoL in cases was 100.0 ± 0.0 and in control was 96.67 ± 6.84 (p= 0.08). Mean social functioning in cases was 68.38 ± 6.05 vs. 70.17 ± 7.40 in controls (p= 0.31) (Table 3).

On assessment of symptomatology, the patients in the case group experienced worse pain (23.81 ± 15.63) vs. 12.17 ± 8.4 in controls (p= 0.018) and other symptoms like fatigue scored greater in control group (cases 29.4 ± 9.4 vs. controls 33.3 ± 0.0; p= 0.06), whereas insomnia scores (cases 23.8 ± 15.6 vs. controls 28.3 ± 4.7; p=0.22) and dyspnoea assessment scores (cases 9.5 ± 5.6 vs. controls 8.3 ± 14.8; p= 0.82) were comparable in both the groups. GI symptoms like constipation (case 26.2 ± 14.2 vs. controls 16.7 ± 17.1; p= 0.097) and vomiting (case 1.2 ± 4.5 vs. controls 5.0 ± 9.5; p= 0.17), appetite loss (case 7.1 ± 14.2 vs. control 8.3 ± 14.9; p= 0.81), diarrhoea (case 4.8 ± 12.1 vs. control 10.0 ± 15.7; p= 0.30). Financial difficulties (case 64.3 ± 15.9 vs. control 66.7 ± 0.00; p= 0.5) were comparable in both the groups (Table 4).

An objective assessment of muscle strength was done in primary movements like extension and adduction by using the Oxford scale. Mean muscle strength in extension movement in cases was 4.39 ± 0.35 and in controls was 4.88 ± 0.22 (p< 0.001), and in case of adduction, it was 4.43 ± 0.18 in cases and 4.65 ± 0.24 in controls (p= 0.006) (Table 5).

The range of motion (ROM) of the shoulder joint was compared in each movement. Mean ROM in flexion was 151.61 ± 4.86° in cases and 153.88 ± 2.36° in controls (p= 0.080); in extension it was 40.36 ± 3.52° in cases and 49.13 ± 1.86° in controls (p< 0.001); in abduction it was 150.54 ± 3.69° in cases and 150.00 ± 0.00° in controls (p= 0.518); in adduction it was 30.89 ± 4.00° in cases and 38.13 ± 1.11° in controls (p< 0.001); in external rotation it was 73.57 ± 3.63° in cases and 77.63 ± 2.36° in controls (p< 0.001); and in internal rotation it was 69.46 ± 3.56° in cases and 79.00 ± 1.26° in controls (p< 0.001). Flexion and abduction were two movements that remained equally restricted among the groups. The cases experienced greater restrictions in extension, adduction, external and internal rotation (Table 6).

Table 3. Comparison of functional score in the patients (cases vs control)

	Cases	Controls	
	Mean ± SD	**Mean ± SD**	**p-value**
Physical functioning	84.29 ± 5.61	86.67 ± 8.38	0.361
Role functioning	79.76 ± 14.88	86.67 ± 11.6	0.138
Emotional functioning	66.67 ± 6.05	70.00 ± 6.84	0.235
Cognitive functioning	100.00 ± 0.0	96.67 ± 6.84	0.079
Social functioning	68.38 ± 6.0	70.17 ± 7.4	0.309

Table 4. Comparisons of symptom score/items in the patients (cases vs control)

	Cases	Control	
	Mean ± SD	**Mean ± SD**	**p-value**
Fatigue	29.37 ± 9.35	33.33 ± 0.00	0.065
Nausea and vomiting	1.19 ± 4.45	5.00 ± 9.52	0.174
Pain	23.81 ± 15.63	12.17 ± 8.4	0.018
Dyspnoea	9.52 ± 15.63	8.33 ± 14.81	0.823
Insomnia	23.81 ± 15.63	28.33 ± 4.67	0.229
Appetite loss	7.14 ± 14.19	8.33 ± 14.81	0.816
Constipation	26.19 ± 14.19	16.67 ± 17.10	0.097
Diarrhea	4.76 ± 12.10	10.00 ± 15.67	0.302
Financial difficulties	64.29 ± 15.82	66.67 ± 0.00	0.502

Table 5. Comparisons of latissimus dorsi muscle strength in terms of its primary motion (cases and control)

	Cases	Control	
	Mean ± SD	**Mean ± SD**	**p-value**
Overall			
Extension	4.39 ± 0.35	4.88 ± 0.22	<0.001
Adduction	4.43 ± 0.18	4.65 ± 0.24	0.006
Right Latissimus dorsi			
Extension	4.21 ± 0.80	4.80 ± 0.41	0.009
Adduction	4.21 ± 0.58	4.65 ± 0.49	0.024
Left Latissimus dorsi			
Extension	4.57 ± 0.76	4.95 ± 0.22	0.042
Adduction	4.64 ± 0.63	4.65 ± 0.49	0.971

Table 6. Comparison of range of motion of the shoulder joint in the patients (cases vs controls)

	Cases	Control	
	Mean ± SD	**Mean ± SD**	**p-value**
Overall			
Flexion	151.61 ± 4.86°	153.88 ± 2.36°	0.080
Extension	40.36 ± 3.52°	49.13 ± 1.86°	<0.001
Abduction	150.54 ± 3.69°	150.00 ± 0.00°	0.518
Adduction	30.89 ± 4.00°	38.13 ± 1.11°	<0.001
External rotation	73.57 ± 3.63°	77.63 ± 2.36°	<0.001
Internal rotation	69.46 ± 3.56°	79.00 ± 1.26°	<0.001
Right Shoulder Joint			
Flexion	150.36 ± 4.58°	152.25 ± 4.13°	0.218
Extension	37.86 ± 3.78°	49.75 ± 1.12°	<0.001
Abduction	150.71 ± 5.50°	150.00 ± 0.00°	0.563
Adduction	28.21 ± 2.49°	37.50 ± 2.56°	<0.001
External rotation	75.36 ± 5.35°	76.50 ± 3.66°	0.465
Internal rotation	68.21 ± 4.64°	79.25 ± 1.83°	<0.001
Left Shoulder Joint			
Flexion	152.86 ± 6.42°	155.50 ± 5.10°	0.191
Extension	42.86 ± 7.26°	48.50 ± 3.28°	0.004
Abduction	150.04 ± 3.08°	150.00 ± 0.00°	0.605
Adduction	33.57 ± 7.70°	38.75 ± 2.22°	0.007
External rotation	71.79 ± 4.64°	78.75 ± 2.75°	<0.001
Internal rotation	70.71 ± 4.32°	78.75 ± 2.22°	<0.001

DISCUSSION

In our study, most of the patients who were treated for breast cancer with BCS and LD flap reconstruction were younger with a mean age of <60 years. The disability scores in both groups were comparable with the majority of the patients having mild to moderate functional impairment. In our study, good quality of life was noted in both groups. Similarly, other functional domains, such as role functioning, emotional functioning, cognitive functioning and social functioning were also found comparable in both groups. Though cases experienced worse pain, other symptoms were similar in either of the groups. Extension and adduction strength were inferior in patients with

LD reconstruction. Flexion and abduction remained equally restricted. The cases had more restrictions in extension, adduction, external and internal rotation.

The age of patients in our study group is similar to that of the study conducted by de Oliveira et al. (8). Majority of women of age >55 years do not prefer extensive procedures like breast reconstruction with LD flap which is a finding also observed by Reddy et al. in a study conducted among Indian women, comparing various treatment options for breast cancer in different age groups. They concluded that breast conservation was less preferred by the elderly, because of barriers like significant comorbidities, restricted physical mobility, and financial considerations (9).

No minimal or severe functional impairment was noted in any of our patients. In a study by Garusi et al., two of the three cases had no to minimal disability. They also stated that in the group of patients who did not practice sports, the median disability score was 18.7, as compared to 7.5 in patients who play sports with LD involvement (10). The higher disability score in our study is probably because most of the women do not practice sports activities nor perform active exercises regularly. Also, poorer follow-up to physiotherapy could also explain the higher score.

To objectively classify the patients in our study, we adopted the division used by Imran et al. in their cross-sectional study on breast cancer patients using the EORTC QLQ-C 30 questionnaire and divided the patients into two groups according to their scores. Patients who scored <33.3% for global health status had poor quality of life and who scored ≥66.7% had good quality of life. A similar division was used for functional scales and symptom scales, a score of <33.3% had a lower level of symptomatology, while patients with a score ≥66.7% had a higher level of symptomatology (11).

In our study, good quality of life was noted in both groups. de Gournay et al., in their retrospective study, have found that there was no significant difference in the quality of life between cases and controls, a finding similar to our study (12).

Extension and adduction strength was lesser in patients with LD reconstruction, though it did not translate to decrease in motion at the shoulder joint. Our results are in agreement with those in the study by Eyjolfsdottir et al., who documented reduced muscle strength in extension and adduction movements using the pulley and weight method in patients with LD flap reconstruction one year after surgery, as compared to their preoperative values (13).

Range of motion of the shoulder joint was compared in each movement of LD, and we found that flexion and abduction were two movements that remained equally restricted among the groups. The cases experienced greater restrictions in extension, adduction, external and internal rotation, although the range of motion remained within normal limits as per the guidelines of American Academy of Orthopedic Surgeons (AAOS) (6).

The study done by Garusi et al. has also assessed the range of motion at the shoulder joint in cases after one year and found that the shoulder joint recovery was >80% in all the movements, using the contralateral latissimus dorsi as a control (10). The range of motion is affected the most in abduction followed by flexion, internal or external rotation, and extension.

The reason for this difference is probably because, in the study of Garusi et al., reconstruction surgery in many patients was done after mastectomy, as compared to our cases where breast conservative surgery was done. Also, since the latissimus dorsi does not actively participate in abduction and flexion, the limitations in these movements may be contributed by other factors (10).

Limitations

The sample size of our study is small, considering the fact that ours is a resource crunch setting in a middle-income country, where most patients belong to the lower economic strata of the society, and not many patients choose for BCS, instead they prefer to go for MRM. Same is the reason why we had to include patients undergoing MRM in the control group. However, the effect that the difference in the types of surgical procedures would have on the shoulder function and kinesiology is far less when compared to that due to LD Flap reconstruction. Hence, this difference won't make any significant difference to the results of our study.

CONCLUSION

Patients with LD flap reconstruction do not have a major disability in performing day-to-day activities or a negative impact on shoulder function after a year of their respective surgeries. They have a good quality of life, and functional domains such as role functioning, emotional functioning, cognitive functioning and social functioning and symptoms are similar. Active exercises and physiotherapy post-surgery may however improve the functional impairment and recovery post -surgery.

Ethics Committee Approval: This study was approved by the King George's Medical University U.P. Institutional Ethics Committee (Decision no: 1728/Ethics/19, Date: 11.11.2019).

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - GNS, PS; Design - GNS, SA; Supervision - GNS, PS; Fundings - GNS, PS; Materials - GNS, PS; Data Collection and/or Processing - SA, SR; Analysis and/or Interpretation - SA, SR; Literature Search - SA, SR; Writing Manuscript - SR; Critical Reviews - GNS, PS.

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ORİJİNAL ÇALIŞMA-ÖZET
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Meme kanseri hastalarında latissimus dorsi miyokutanöz flep rekonstrüksiyonu sonrası omuz hareketlerinin fonksiyonel bozukluğu, yaşam kalitesi ve engellilik üzerine prospektif bir vaka kontrol çalışması

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ÖZET

Giriş ve Amaç: Omuz hareketlerindeki disfonksiyon latissimus dorsi (LD) flebinin kullanımını sınırlayıcı bir faktör olabilir. Bu çalışmanın amacı, LD flep rekonstrüksiyonunun omuz disfonksiyonu ve yaşam kalitesi üzerine etkisini değerlendirmekti.

Gereç ve Yöntem: Bu çalışmaya LD flep ile meme koruyucu cerrahi (MKC) uygulanan 28 erken evre meme kanseri olgusu ve 40 kontrol olgusu dahil edildi. Bir yıl sonra subjektif ve objektif değerlendirmeler yapıldı.

Bulgular: Hafif ve orta derecede engellilik sırasıyla %85,71 ve %14,3 olguda, %100 ve %0 kontrol grubunda saptandı (p= 0,316). Fiziksel ve duygusal işlevsellik olgularda sırasıyla 84,29 ± 5,61 ve 66,67 ± 6,05 iken kontrollerde 86,67 ± 8,38 ve 70,0 ± 6,84 idi (p= 0,36, 0,23). Olgularda ağrı skoru 23,8 ± 15,6 iken kontrollerde 12,17 ± 8,4 idi (p= 0,018). LD kas gücü ekstansiyonda olgularda 4,39 ± 0,35 iken kontrollerde 4,88 ± 0,22 (p< 0,001), addüksiyonda olgularda 4,43 ± 0,18 iken kontrollerde 4,65 ± 0,24 idi (p= 0,006). Omuzun hareket açıklığı fleksiyonda olgularda 151,61 ± 4,86° iken kontrollerde 153,88 ± 2,36° (p= 0,08), ekstansiyonda olgularda 40,36 ± 3,52° iken kontrollerde 49,13 ± 1,86° (p< 0,001), abdüksiyonda olgularda 150,54 ± 3,69° iken kontrollerde 150,00 ± 0,00° (p= 0,518), addüksiyonda olgularda 30,89 ± 4,0°'ye karşı kontrollerde 38,13 ± 1,11° (p< 0,001), dış rotasyonda olgularda 73,57 ± 3,63°'ye karşı kontrollerde 77,63 ± 2,36° (p< 0,001) ve iç rotasyonda olgularda 69,46 ± 3,56°'ye karşı kontrollerde 79,00 ± 1,26° idi (p< 0,001).

Sonuç: Meme rekonstrüksiyonu cerrahisinde fonksiyonel bozukluğun LD flep için belirleyici bir faktör olmaması gerektiği sonucuna vardık.

Anahtar Kelimeler: Latissimus dorsi, flep rekonstrüksiyonu, yaşam kalitesi, omuz disfonksiyonu, meme koruyucu cerrahi

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