Shoulder dysfunction after partial mastectomy and mini-latissimus dorsi or thoracodorsal artery perforator flaps for breast cancer according to the type of axillary surgeries

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Background
Breast cancer is the most common cancer type among women and can lead to death. Over the past few decades, there has been a significant change in the surgical management of breast cancer. The aim of this study is to assess how shoulder function was affected by reconstruction using latissimus dorsi mini flap (LDMF) and thoracodorsal artery perforator (TDAP) flaps following partial mastectomy according to surgeries to axilla.

Patients and methods
This was a prospective randomized study carried out on 40 consecutive female patients, complaining of early stages of breast cancer (stages I, II), undergo partial breast resection and with small tumor to breast volume ratio. All patients were randomized into two equal groups. Group I: early breast cancer (stages I, II) who underwent mastectomy defect by either TDAP flap. Group II: early breast cancer (stages I, II) who underwent mastectomy LDMF. Axillary surgeries were done to each group either sentinel lymph node biopsy dissection (SLND) or axillary lymph node dissection (ALND).

Results
Shoulder mobility affection 6 months postoperative was significantly higher in LDMF group than TDAP flap group (P=0.045). Regarding relation between types of lymph node surgeries and shoulder mobility affection 3–6 months postoperative, shoulder mobility affection was significantly different among the four groups as affected although ALND and LDMF group was higher. Relation between types of lymph node surgeries and effect on shoulder mobility 6 months, shoulder mobility was normal in 16 (72.73%) patients in sentinel lymph node biopsy (SLNB) and in seven (38.89%) patients in ALND and effected in six (27.27%) patients in SLNB and in 11 (61.11%) patients in ALND. Regarding shoulder mobility, affection was significantly higher in ALND than SLNB (P=0.031).

Conclusions
The LDMF approach with ALND is with higher shoulder mobility affection in postoperative follow-up after partial mastectomy than LDMF with SLND, TDAP flap with ALND, and TDAP flap with SLND. According to the different types of axillary surgery, ALND had higher shoulder mobility affection.

Keywords:
axillary surgeries, breast cancer, mini-latissimus dorsi, partial mastectomy, shoulder dysfunction, thoracodorsal artery perforator flaps

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Introduction

Breast cancer is the most common cancer type among women and can lead to death. Data from the WHO show that developing countries have seen a significant rise in both the prevalence and mortality of breast cancer [1]. Surgical intervention is typically the first step in the treatment of early-stage breast cancer, and cavity filling is required following partial mastectomy [2].

Even though sentinel lymph node biopsy (SLNB) has essentially taken the position of axillary lymph node dissection (ALND) for patients with cN0 breast cancer, ALND is still a crucial part of the surgical therapy of breast cancer [3]. ALND regulates regional nodal disease and has the potential to increase overall survival so it is advantageous for breast cancer patients. The well-known complications of ALND include arm numbness, lymphangitis, wound infection, and restricted arm movement [4].

Regarding breast reconstruction following breast cancer, several basic techniques are accessible. Volume replacement treatments, such as local fasciocutaneous flaps and latissimus dorsi mini flaps (LDMF), combine rapid restoration of the defect utilizing autologous tissue with resection [5].

An alternate approach is the fasciocutaneous thoracodorsal artery perforator (TDAP) flap. It is predicated on a thoracodorsal artery musculocutaneous perforator or perforators. For deformities of the head, neck, and extremities, the TDAP flap is a good option. With the benefit of avoiding both primary closure of the donor site and postoperative partial or total loss of the flap, a sizable portion of the flap can be harvested with a single perforator [6].

Patients with breast cancer experience difficulties with their shoulders when performing daily tasks such reaching above, carrying heavy bags, zipping up a back zipper, pulling on sweaters, and attaching bras [7]. Even years after surgery, many women with breast cancer are still unable to stretch their elbows to 150° and their shoulders to 130°. Because of this, only 59% of breast cancer survivors returned back to work, and even among those who did, many of them were unable to do so full-time due to physical ailments, such as these shoulder affection [8].

Numerous studies in the literature state that the shoulder joint's functional impairment might range from negligible to considerable when the LD muscle is transferred. The majority of research concurs that the functional loss in the shoulder following LD muscle transfer is most severe during the first 3–6 months after surgery and returns to baseline levels by the 1-year mark [9]. A few years following surgery, certain functional tests have discovered an objective reduction of shoulder torque strength [10].

This study looked at how reconstruction using mini-latissimus dorsi flap (MLDF) and TDAP flaps affected shoulder functioning following partial mastectomy.

Patients and methods

This prospective randomized study was carried out on 40 consecutive female patients, complaining of early breast cancer (stages I, II), undergo partial breast resection (lumpectomy or quadrantectomy with ALND) and with small tumor to breast volume ratio. The study was done after approval from the Ethical Committee Kafrelsheikh University Hospital, Faculty of Medicine, Kafrelsheikh, Egypt and Surgical Oncology Department, Faculty of Medicine, Mansoura University, Mansoura, Egypt. An informed written consent was obtained from all patients.

Males with breast cancer, patients contraindicated for radiation, patients with a history of radiation therapy, multicentric lesions, large tumor to breast volume ratios, recurrent lesions, previous division of the thoracodorsal pedicles, ipsilateral thoracotomy with division of the LD muscle, and inability to attain free safety margin were among the exclusion criteria.

Randomization

All patients were randomized into two equal groups in a parallel manner by computer generated numbers and their allocation code was kept in a closed opaque envelope: group I: early breast cancer (stages I, II) who underwent mastectomy defect by either TDAP flap. Group II: early breast cancer (stages I, II) who underwent mastectomy the LDMF. Axillary surgeries were done to each group either SLNB or ALND.

All patients were subjected to: history taking, clinical history, general examination (chest, abdominal, and pelvic examination for distant metastasis), and local examination [asymmetry, enlargement, skin dimpling, skin puckering, peau orange, skin nodules or ulceration, assessment of breast lump: its texture, mobility, fixation to the skin, underlying muscles or chest wall, nipple retraction and axillary lymph node palpation for number and mobility, breast characteristic as cup size, tumor site and quadrants (upper outer quadrant, lower outer quadrant)], routine laboratory investigations (complete blood count, liver and kidney function tests, coagulation profile test, and tumor markers) and radiological investigations [breast and axillary ultrasound, mammogram, MRI, pathological confirmation (Turcot biopsy), and metastatic workup (abdominal ultrasound, bone survey or scan, and chest radiograph)].

Operative techniques

Latissimus dorsi mini-flap technique

It was simpler for the surgeon and the patient to do the entire procedure while the patient was in a supine posture. Following the contour of the tumor on the skin, a 2 cm circular line was drawn around the tumor to indicate the safety margin. The apex of the axilla was used to initiate an S-shaped incision that extended through the lateral breast border and ended at the outside edge of the infra-mammary fold. Mark the LD anterior boundary after that.

Wide local excision utilizing the oncoplastic principles; the tumor was widely excised locally after the S-shaped incision was made deeply into the subcutaneous fat and extended medially to the free outer border of the pectoralis major muscle. A frozen section analysis verified the tumor's 'negative' margin status.

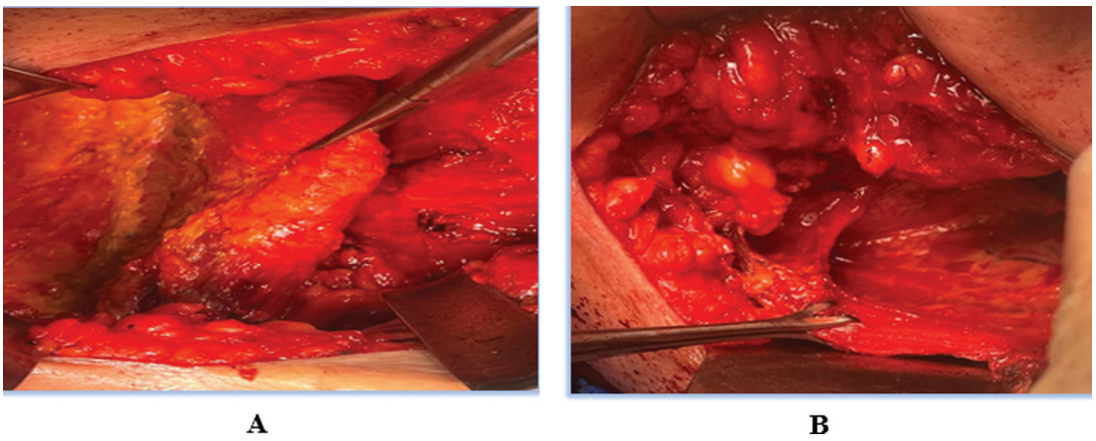
Mini-flap harvest and volume replacement: in the premuscular plane, a superficial subcutaneous pocket was formed, extending from the LD muscle's anterior border dorsally to the level of the costal edge inferiorly and the lumbosacral fascia dorsally. The superficial premuscular pocket's dimensions were shared by the second deep muscular pocket, which was formed deep to the LD muscle. The muscle was first divided distally, and then posteriorly, passing up to the interval between LD and teres major muscles (Fig. 1).

After division, the LDMF could be fully mobilized and delivered into the wound. After that, the tendon of the muscle is divided, leaving the flap attached only by the serratus anterior and thoracodorsal pedicles. This allowed maximum mobility during the flap repositioning into the defect. Moreover, the flap could be positioned more medially by division of the serratus anterior branches. Lastly the flap was folded and sutured to match the shape of the resection defect. The tendinous end of the flap was sutured to the outer free border of pectoralis major for protection of the thoracodorsal pedicle and prevention of flap retraction from the defect. The defect edges were sutured into the flap with a few interrupted sutures to fold it into a shape that conforms to the defect. By folding over the tip of the flap, its most bulky part laid in the deepest part of the cavity (Fig. 2).

Thoracodorsal artery perforator flap

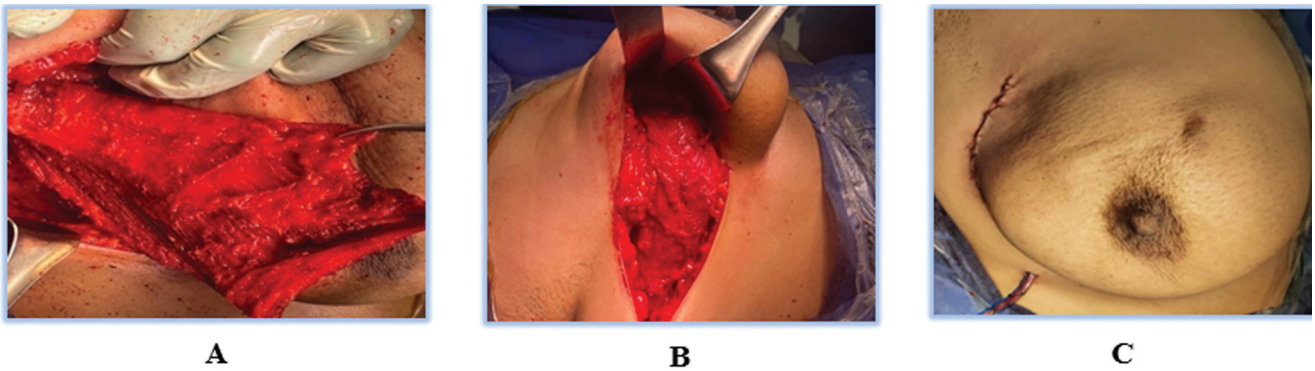
Using a portable Doppler, the location of the TDAP was marked preoperatively, and two anatomical landmarks were identified. The initial point was near the middle of the flap, 2 cm below the lateral border of the LD muscle and 8 cm below the posterior axillary

Figure 1



Creation of superficial and deep pocket around LD muscle. (a) Creation of the lateral pocket (b) Creation on the medial pocket. LD, latissimus dorsi.

Figure 2



(a) Fully mobilization and delivered into the wound, (b) Filling the defect by LD mini flap, and (c) wound closure with drain. LD, latissimus dorsi.

fold. This location corresponded to the place where the proximal skin perforator emerged from the thoracodorsal artery's descending branch and exited the LD muscle to enter the SC tissue. The second point was situated 1–4 cm medial to the lateral free border of the LD muscle and 3–6 cm below the inferior scapular tip.

The location of the thoracodorsal artery bifurcation corresponded to this place. The TDAP flap was marked in a standing posture with the hands on the waist and the arms at the sides following the assessment of the location and volume deficiency. It was intended to pass over the lateral border of the LD muscle and to enclose the previously located artery's location in its middle. The potential for immediate closure of the donor site influenced the design of the TDAP flap's breadth.

After the vascular pedicle was cut to a sufficient length to enable tension-free flap insertion into the breast defect, the donor region was immediately closed in two layers.

Intraoperative parameters were recorded such as operation duration (min), lymph node kinds, number of excised lymph nodes, number of impacted lymph nodes, and margin layout (Fig. 3).

Axilla surgeries

Surgeries for axilla were either SLNB by injection of blue dye and removal at least three to five stained LNs or ALND (Fig. 4).

In two surgical techniques

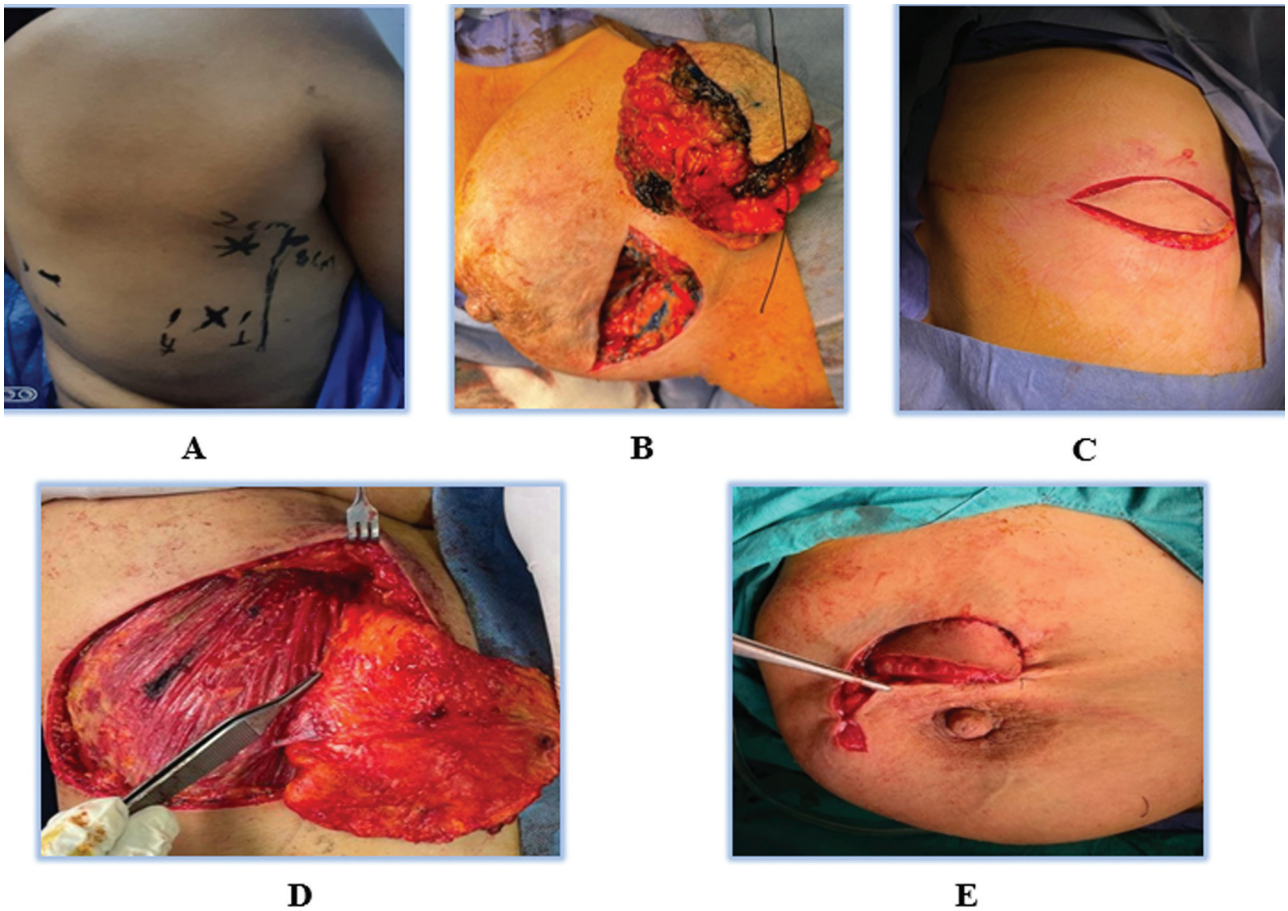
Tumor site, tumor size was accurately measured, the total number of axillary lymph nodes removed were recorded, multiplicity if present, any intraoperative complication, or difficulty were recorded, the site of the mass excised was marked intraoperatively by metallic clips.

Assessment

Quick DASH score

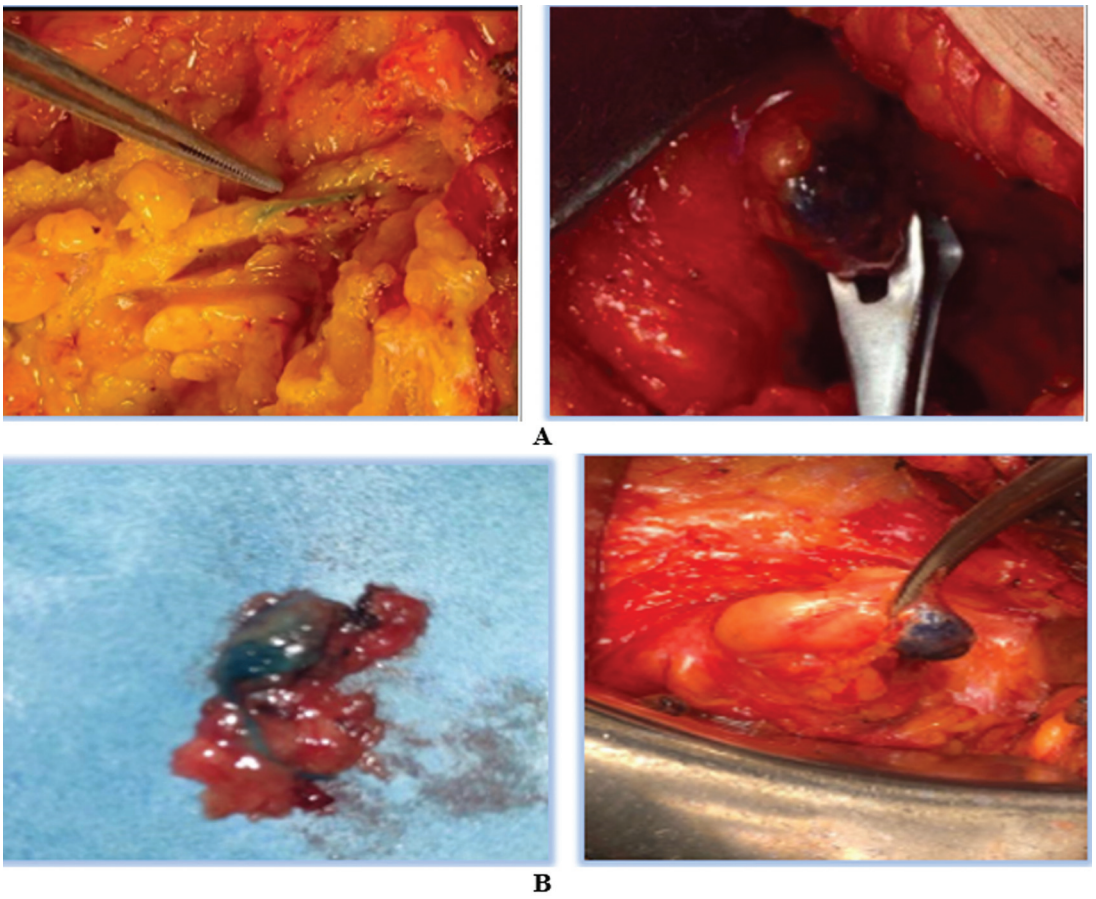
Q-DASH was used to examine the functional status of the upper extremities. A regional outcome criteria called Q-DASH was created specifically for diseases

Figure 3



(a) Marking of the site of the TDAP, (b) partial mastectomy done with safety margin, (c) elliptical incision in the back, (d) TDAP perforator identification, and (e) passage of the flap to the site of defect. TDAP, thoracodorsal artery perforator.

Figure 4



(a) Sentinel lymph node dissection and (b) sentinel lymph node biopsy.

of the musculoskeletal system in the upper extremities. It is optional, assesses every function of the upper extremities, and has modules for musicians and athletes. There are 11 questions on it. At least 10 of the 11 questions must be answered in order to determine the score of the criterion that may be used in place of Q-DASH. Every question has a five-point Likert scale assigned to it. The overall score of the questionnaire is determined by dividing the total points earned from marked questions by the total number of marked questions than 1 subtracted from the result, and multiplying the result by 25. A score of 0–20 denotes normal, 21–40 shows slight disability, 41–60 suggests moderate disability, and 61–80 indicates severe disability [11]. Quick DASH disability/symptom score=(sum of n responses/n−1×25), where n is equal to the number (Fig. 5).

Follow-up postdischarge

Postoperative visits were once weekly at outpatient clinic at the first month postoperatively and once monthly for 6 months. Histopathological examination: type of the excised specimen was recorded with its safety margins, number of the affected lymph nodes, tumor grading, and staging. Number of postoperative radiotherapy sessions. Number of postoperative chemotherapy sessions. Period of hormonal adjuvant therapy intake if needed. Recurrent cases if present.

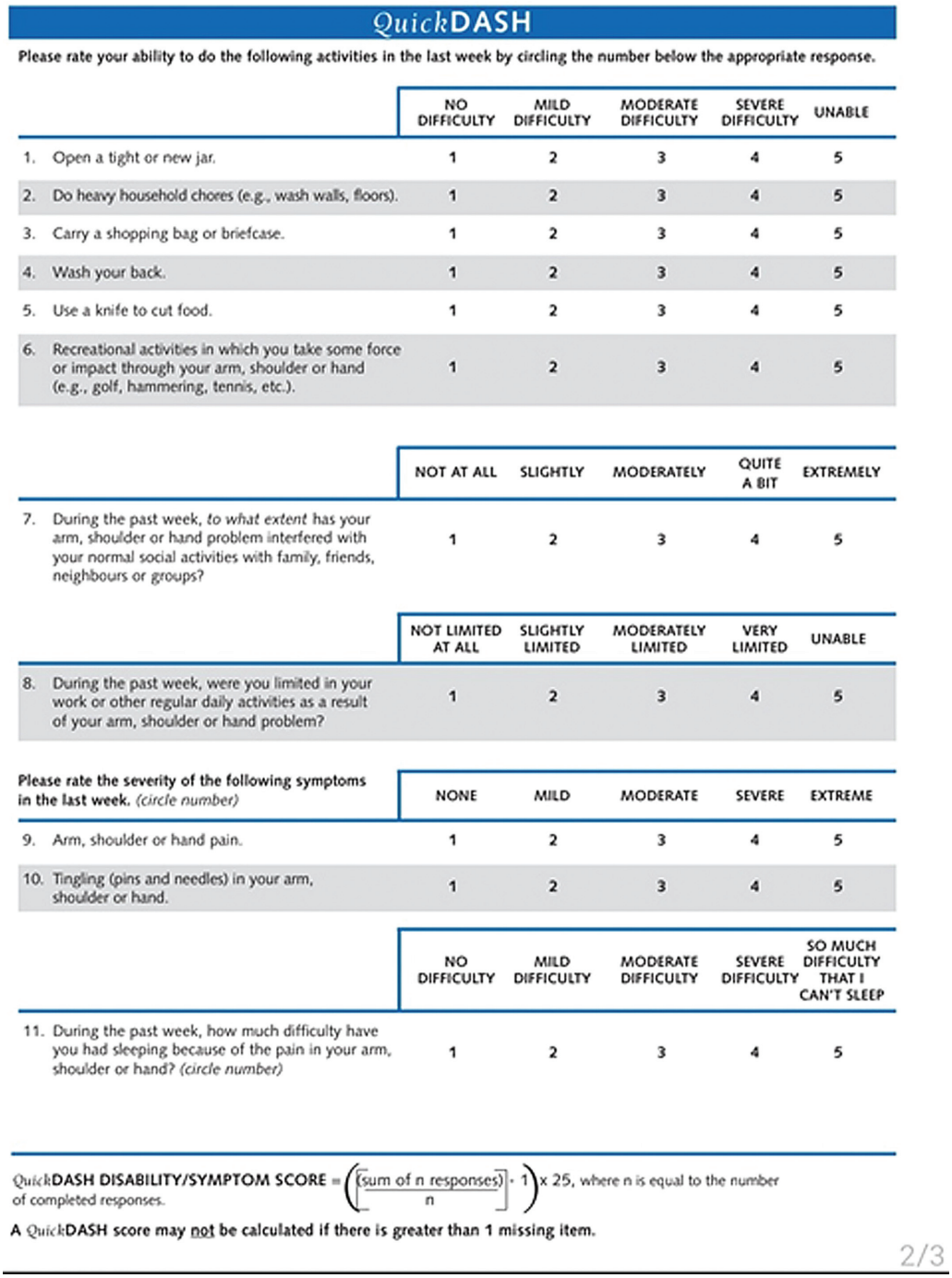
Statistical analysis

Statistical analysis was done by SPSS, v26 (IBM Inc., Chicago, Illinois, USA). The Shapiro–Wilks test and histograms were used to evaluate the normality of the distribution of data. Quantitative parametric variables were presented as mean and SD and compared between the two groups utilizing unpaired Student's t test. Quantitative nonparametric data were presented as median and interquartile range and were analyzed by Mann–Whitney test. Qualitative variables were presented as frequency and percentage and were analyzed utilizing the χ^2 test or Fisher's exact test when appropriate. A two-tailed P value less than 0.05 was considered statistically significant.

Results

In this study, 52 patients were assessed for eligibility, seven patients did not meet the criteria and five patients refused to participate in the study. The remaining

Figure 5



QuickDASH

Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. Open a tight or new jar.	1	2	3	4	5
2. Do heavy household chores (e.g., wash walls, floors).	1	2	3	4	5
3. Carry a shopping bag or briefcase.	1	2	3	4	5
4. Wash your back.	1	2	3	4	5
5. Use a knife to cut food.	1	2	3	4	5
6. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).	1	2	3	4	5

	NOT AT ALL	SLIGHTLY	MODERATELY	QUITE A BIT	EXTREMELY
7. During the past week, *to what extent* has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups?	1	2	3	4	5

	NOT LIMITED AT ALL	SLIGHTLY LIMITED	MODERATELY LIMITED	VERY LIMITED	UNABLE
8. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem?	1	2	3	4	5

Please rate the severity of the following symptoms in the last week. *(circle number)*	NONE	MILD	MODERATE	SEVERE	EXTREME
9. Arm, shoulder or hand pain.	1	2	3	4	5
10. Tingling (pins and needles) in your arm, shoulder or hand.	1	2	3	4	5

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	SO MUCH DIFFICULTY THAT I CAN'T SLEEP
11. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand? *(circle number)*	1	2	3	4	5

QuickDASH DISABILITY/SYMPTOM SCORE = $\left(\left[\frac{\text{sum of n responses}}{n}\right] - 1\right) \times 25$, where n is equal to the number of completed responses.

A QuickDASH score may not be calculated if there is greater than 1 missing item.

2/3

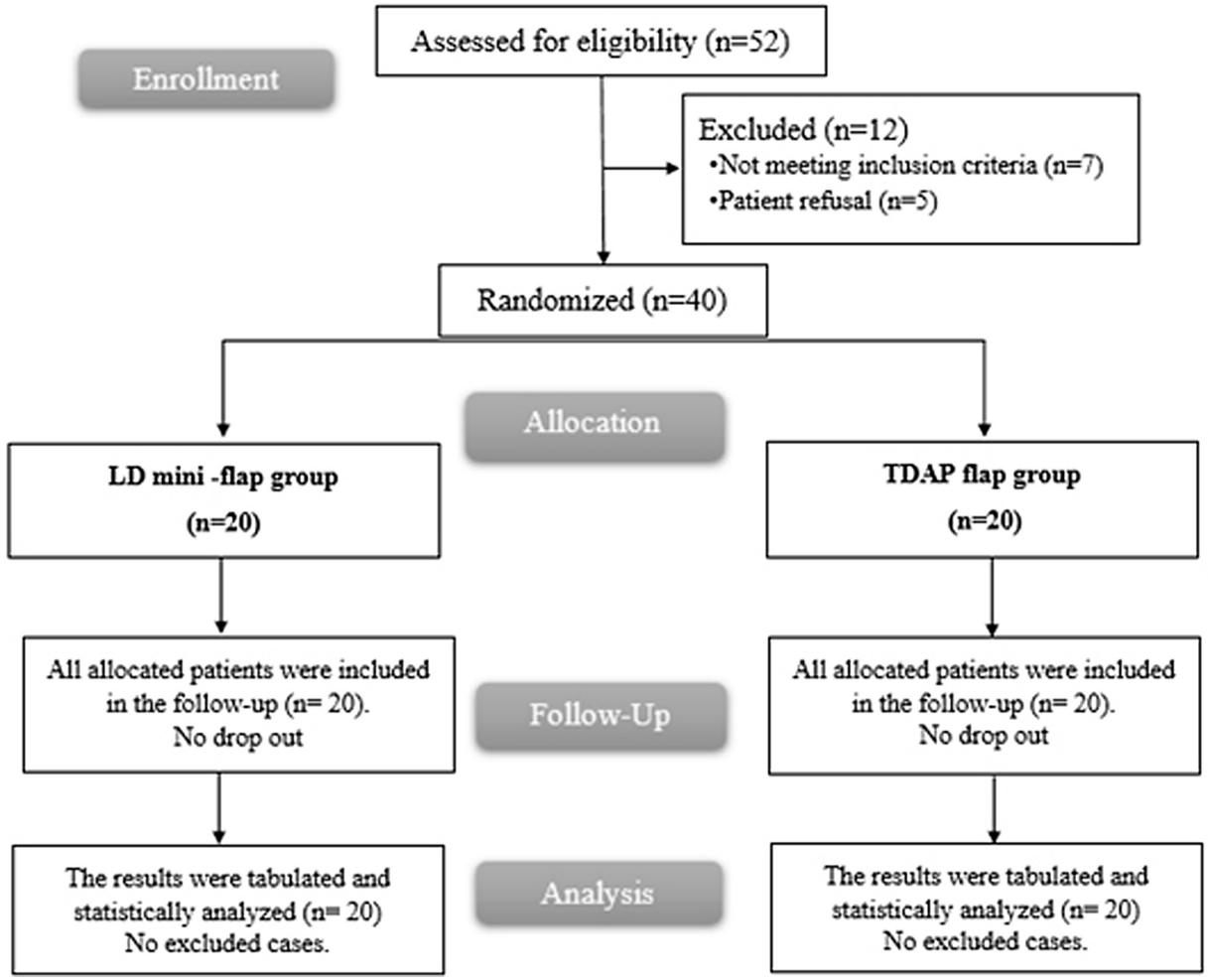
Q-DASH.

patients were randomly allocated into two equal groups (20 patients in each). All allocated patients were followed-up and analyzed statistically (Fig. 6).

Age, American Society of Anesthesiology physical status, type of tumor, estrogen receptor, partial tumor response, human epidermal growth factor receptor 2, Ki 76, biological classification, T stage, N stage, stage IIA, stage IIB, and neoadjuvant chemotherapy were insignificantly different between the two groups. No patients underwent to previous breast surgery (Table 1).

Types of lymph node, number of lymph node removed, number of lymph node affected, and intraoperative redo of safety margin were insignificantly different between two groups. Failure to achieve safety margin and conversion to mastectomy did not occur in any patients in both groups. Shoulder mobility affection 3–6 months

Figure 6



CONSORT flowchart of the enrolled patients.

postoperative was significantly higher in LDMF group than TDAP flap group (P=0.045) (Table 2).

Operation time was significantly lower in LDMF group than TDAP flap group (P=0.032). Regarding relation between types of lymph node surgeries and shoulder mobility affection 3–6 months postoperative of the studied groups, shoulder mobility affection was significantly different among the four groups as affected ALND and LDMF group was higher. Relation between types of lymph node surgeries and effect on shoulder mobility 3–6 months of the studied patients, shoulder mobility was normal in 16 (72.73%) patients in SLNB and in seven (38.89%) patients in ALND and effected in six (27.27%) patients in SLNB and in 11 (61.11%) patients in ALND. Regarding shoulder mobility 3–6 months, affected was significantly higher in ALND than SLNB (P=0.031) (Table 3).

Discussion

A myocutaneous LD has been the mainstay of breast restoration since the 1970s even in the days of perforator flaps and microsurgery [12]. The TDAP flap has been more popular among reconstructive surgeons in the last few years. Because of its adaptability, dependability, and very low morbidity, it is gaining popularity. A further option is the fasciocutaneous flap known as the TDAP flap. Theoretically, it has the benefit of preserving the LD muscle, which lowers donor site morbidity [13].

In our investigation, the operative time was with a mean value (±SD) of 2.48 (±0.48) min in mini-LD flap group and 2.9 (±0.72) in TDAP group. The operation time was significantly lower in LDMF group than TDAP flap group.

The short operative time for LDMF can be attributed to LDMF may be a less complex procedure compared

Table 1 Demographic data and tumor characteristic of the studied groups

	LD mini-flap group (*N*=20)	TDAP flap group (*N*=20)	*P* value
Age (years)	43.3±8.81	46.35±3.47	0.158
ASA physical status			
I	17 (85)	12 (60)	0.077
II	3 (15)	8 (40)	
Comorbidities			
HTN	6 (30)	12 (60)	0.057
DM	3 (15)	0	0.072
DVT	2 (10)	0	0.147
Previous breast surgery	0	0	–
Type of tumor			
IDC	17 (85)	18 (90)	0.307
ILC	1 (5)	2 (10)	
ILC and ILC	2 (10)	0	
Tumor receptors			
ER			
Positive	16 (80)	17 (85)	0.677
Negative	4 (20)	3 (15)	
PR			
Positive	17 (85)	20 (100)	0.072
Negative	3 (15)	0	
HER2			
Positive	3 (15)	0	0.072
Negative	17 (85)	20 (100)	
Ki 76 (%)			
<14	12 (60)	13 (65)	0.744
>14	8 (40)	7 (35)	
Biological classification			
Luminal A	14 (70)	16 (80)	0.279
Luminal B	2 (10)	4 (20)	
HER2 enriched	3 (15)	0	
TNBC	1 (5)	0	
Tumor stages			
T stage			
T1	2 (10)	4 (20)	0.212
T2	17 (85)	16 (80)	
T3	1 (5)	0	
N stage			
N0	10 (50)	12 (60)	0.525
N1	10 (50)	8 (40)	
M stage			
M0	20 (100)	20 (100)	–
Stage I			
T1N0M0	1 (5)	2 (10)	0.646
Stage IIA			
T1N1M0	1 (5)	2 (10)	
T2N0M0	8 (40)	10 (50)	
Stage IIB			
T2N1M0	9 (45)	6 (30)	
T3N0M0	1 (5)	0	
NACT			
Yes	9 (45)	8 (40)	0.749

Data are presented as mean±SD or *n* (%). ASA, American Society of Anesthesiology; DM, diabetes myelitis; DVT, deep vein thrombosis; ER, estrogen receptor; HER2, human epidermal growth factor receptor 2; HTN, hypertension; IDC, invasive ductal carcinoma; ILC, infiltrating lobular carcinoma; LD, latissimus dorsi; NACT, neoadjuvant chemotherapy; PR, partial tumor response; TDAP, thoracodorsal artery perforator.

with certain larger flaps. The complexity of the surgical technique, the number of steps involved, and the intricacy of tissue manipulation. Also, the LDMF may involve less extensive tissue dissection and

Table 2 Intraoperative data and functional outcome of the studied groups

	LD mini-flap group (*N*=20)	TDAP flap group (*N*=20)	*P* value
Operation time (min)	149.25±29.35	175.5±43.68	0.032*
Types of lymph node			
SLNB	10 (50)	12 (60)	0.525
ALND	10 (50)	8 (40)	
Number of lymph node removed	7.9±5.23	6.45±3.8	0.322
Number of lymph node affected	2.1±2.61	0.9±1.41	0.079
Intraoperative redo of safety margin			
Positive	6 (30)	2 (10)	0.114
Negative	14 (70)	18 (90)	
Failure to achieve safety margin	0	0	–
Conversion to mastectomy	0	0	–
Functional outcome			
Shoulder mobility assessed by Quick DASH scale			
Mean±SD	25.65±11.44	17.15±14.31	0.045*
Normal	8 (40)	15 (75)	0.029*
Slight affected	11 (55)	3 (15)	
Moderate affected	1 (5)	2 (10)	

Data are presented as mean±SD or *n* (%). ALND, axillary lymph node dissection; LD, latissimus dorsi; SLNB, sentinel lymph node biopsy; TDAP, Thoracodorsal artery perforator. *Significant as *P* value less than or equal to 0.05.

Table 3 Postoperative data of the studied groups

Relation between types of lymph node and shoulder mobility 3–6 months of the studied groups					
	MLDF with SLNB (*N*=10)	MLDF with ALND (*N*=10)	TDAP with SLNB (*N*=12)	TDAP with ALND (*N*=8)	
Effect on shoulder mobility					
Normal	6 (15)	2 (5)	10 (25)	5 (12.5)	0.027*
Affected	4 (10)	8 (20)	2 (5)	3 (7.5)	
Relation between types of lymph node and effect on shoulder mobility 3–6 months of the studied patients					
	SLNB (*N*=22)		ALND (*N*=18)		
Shoulder mobility 6 months					
Normal	16 (72.73)		7 (38.89)		0.031*
Affected	6 (27.27)		11 (61.11)		

Data are presented as *n* (%). ALND, axillary lymph node dissection; MLDF, mini-latissimus dorsi flap; SLNB, sentinel lymph node biopsy; TDAP, thoracodorsal artery perforator. *Significant as *P* value less than or equal to 0.05.

mobilization compared with TDAP. The LDMF typically relies on the blood supply from specific vascular pedicles within the muscle. Preserving these vessels allows for a smaller, more localized dissection, reducing the need for extensive mobilization. While TDAP flap require more intricate vascular connections or longer vessel dissection may take longer to perform [14].

Near to our findings, Hassan *et al.* [15] noticed that the operative time was with a mean value (±SD) of 2.74 (±0.82) min in mini-LD flap group and 2.34 (±0.91) in perforator group. The operative time was insignificant between LDMF group and perforator group. This difference may be related to large sample size and using different perforator techniques including the lateral intercostal artery perforator flap. Also, Abdelrahman *et al.* [6] stated that the mean operative time was insignificant between LD group and TDAP group.

In our study, intraoperative redo of safety margin was present in six (30%) patients in LDMF group and was present in two (10%) patients in TDAP flap group. Failure to achieve safety margin and conversion to mastectomy did not occur in any patients in either group.

Our study revealed that shoulder mobility affection 6 months was significantly higher in LDMF group than TDAP flap group.

In agreement with our results, Abdelrahman *et al.* [6] showed that mobility affection 6 months was significantly higher in LD flap group than TDAP flap group. A similar result was reported by

Peintinger *et al.* [16] conducted a prospective, longitudinal study on 56 patients with invasive breast cancer who received the SLNB. In all, 25 patients received the SLNB only and 31 patients underwent the standard levels I and II ALND. They showed that shoulder mobility was significantly higher in SNLB group than ALND. Also, Russell *et al.* [17] set out a study to determine the extent of functional deficit following the use of the LD muscle for reconstructive purposes. Twenty-four patients, 9–65 years of age, were studied for 3–24 months after pedicled or free LD muscle transfer. They stated that shoulder mobility in the operated shoulder was significantly lower than the nonoperated side, so some patients demonstrated a decreased shoulder mobility following muscle transfer.

On the contrary, Hassan *et al.* [15] found that shoulder mobility affection 6 months was significantly lower in LDMF group than perforator group. This difference may be related to different techniques and large sample size. This difference may be related to large sample size and using different perforator techniques including the lateral intercostal artery perforator flap. Also, Hamdi *et al.* [18] conducted a study on 32 patients who underwent partial breast reconstruction using a pedicled TDAP flap. They showed that shoulder mobility was statistically comparable to the unoperated side which showed that pedicled TDAP flap surgery did not have any adverse effects on the operated side.

In our study, shoulder mobility affection was significantly higher in ALND than SLNB. Shoulder mobility affection 6 months was significantly higher in affected ALND patients in LDMF group.

In agreement with our results, Duymaz *et al.* [2] conducted a cross-sectional descriptive study on 174 patients, aged between 23 and 73 years old, having BCS with a diagnosis of stage I or stage II breast cancer, having received radiotherapy and chemotherapy, having no neurologic, orthopedic, or rheumatic diseases affecting upper extremity function, and not having any disability related to the upper extremities before the surgery. They found that in LDMF group shoulder mobility affection was significantly higher in ALND than SLNB.

A similar result was reported by, Monleon *et al.* [19] who conducted prospective longitudinal observational study on 112 females with breast cancer; 44 underwent ALND and 68 underwent SLNB. They showed that the shoulder mobility affection was significantly higher in ALND than SLNB.

On the other side, Laitung and Peck [20] examined shoulder mobility in 19 patients 2 months to 4 years after an operation in which the latissimus was removed and used as a free flap. They found that with arms at 90° of abduction wasn't affected after surgery. They concluded that latissimus muscle transfer did not affect shoulder function.

In our study, drain removal and hospital stay were significantly lower in the LDMF group than in the TDAP flap group. This is due to higher patients undergoing ALND which had negative effect on shoulder mobility and may lead to longer hospital stay. In disagreement with our results, Abdelrahman *et al.* [6] exhibited that postoperative hospital stay was insignificant between LD flap group than TDAP flap group. Also, Hassan *et al.* [15] found that postoperative hospital stay was insignificant between LDMF group than perforator flap group.

Limitations

Small sample size that may produce insignificant results and relatively short follow-up periods.

Conclusions

The LDMF approach with ALND is with higher shoulder mobility affection in postoperative follow-up after partial mastectomy than LDMF with sentinel lymph node dissection, TDAP flap with ALND and TDAP flap with sentinel lymph node dissection. According to the different types of axillary surgery, ALND had higher shoulder mobility affection.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1 Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, *et al.* Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. Int J Cancer 2015; 136:E359–E386.

2 Duymaz T, İyigün ZE, İlgün AS, Ordu Ç, Üçüncü M, Alço G, *et al.* The effect of mini-latissimus dorsi flap (MLDF) reconstruction on shoulder function in breast cancer patients. Eur J Breast Health 2019; 15:158–162.

3 Van Pham P. Breast cancer: from biology to medicine: BoD-Books on Demand. Intechopen 2017.

4 Abass MO, Gismalla MDA, Alsheikh AA, Elhassan MMA. Axillary lymph node dissection for breast cancer: efficacy and complication in developing countries. J Glob Oncol 2018; 4:1–8.

5 Szychta P, Butterworth M, Dixon M, Kulkarni D, Stewart K, Raine C. Breast reconstruction with the denervated latissimus dorsi musculocutaneous flap. Breast 2013; 22:667–672.

6 Abdelrahman EM, Nawar AM, Balbaa MA, Shoulah AA, Shora AA, Kharoub MS. Oncoplastic volume replacement for breast cancer: latissimus dorsi flap versus thoracodorsal artery perforator flap. Plast Reconstr Surg Glob Open 2019; 7:e2476.

7 Oosterwijk AM, Nieuwenhuis MK, van der Schans CP, Mouton LJ. Shoulder and elbow range of motion for the performance of activities of daily living: a systematic review. Physiother Theory Pract 2018; 34:505–528.

8 Min J, Kim JY, Yeon S, Ryu J, Min JJ, Park S, *et al.* Change in shoulder function in the early recovery phase after breast cancer surgery: a prospective observational study. J Clin Med 2021; 10:3416.

9 Blackburn NE, Mc Veigh JG, Mc Caughan E, Wilson IM. The musculoskeletal consequences of breast reconstruction using the latissimus dorsi muscle for women following mastectomy for breast cancer: a critical review. Eur J Cancer Care (Engl) 2018; 27:e12664.

10 van Huizum MA, Hoornweg MJ, de Ruiter N, Oudenhoven E, Hage JJ, Veeger DJ. Effect of latissimus dorsi flap breast reconstruction on the strength profile of the upper extremity. J Plast Surg Hand Surg 2016; 50:202–207.

11 LeBlanc M, Stineman M, DeMichele A, Stricker C, Mao JJ. Validation of QuickDASH outcome measure in breast cancer survivors for upper extremity disability. Arch Phys Med Rehabil 2014; 95:493–498.

12 Escandón JM, Manrique OJ, Christiano JG, Mroueh V, Prieto PA, Gooch JC, *et al.* Breast reconstruction with latissimus dorsi flap: a comprehensive review and case series. Ann Transl Med 2023; 11:35–38.

13 Alabdulkareem M, Berkane Y, Le Bras E, Rousson E, Chrelias T, Beaufils T, *et al.* Axillary hidradenitis suppurativa: a comparison between two perforator flap reconstructive approaches after radical surgical management. Plast Reconstr Surg Glob Open 2023; 11:53–59.

14 Thomsen JB, Rindom MB, Rancati A, Angrigiani C. Thoracodorsal artery flaps for breast reconstruction – the variants and its approach. Arch Plast Surg 2021; 48:15–25.

15 Hassan A, Abdelghafar MA, Taha A, Denewer OH, Kotb S. Mini-LDF versus perforator flaps in oncoplastic breast surgery. European Chemical Bulletin 2023:2–10.

16 Peintinger F, Reitsamer R, Stranzl H, Ralph G. Comparison of quality of life and arm complaints after axillary lymph node dissection vs sentinel lymph node biopsy in breast cancer patients. Br J Cancer 2003; 89: 648–652.

17 Russell RC, Pribaz J, Zook EG, Leighton WD, Eriksson E, Smith CJ. Functional evaluation of latissimus dorsi donor site. Plast Reconstr Surg 1986; 78:336–344.

18 Hamdi M, Decorte T, Demuynck M, Defrene B, Fredrickx A, Maele GV, *et al.* Shoulder function after harvesting a thoracodorsal artery perforator flap. Plast Reconstr Surg 2008; 122:1111–1117.

19 Monleon S, Ferrer M, Tejero M, Pont A, Piqueras M, Belmonte R. Shoulder strength changes one year after axillary lymph node dissection or sentinel lymph node biopsy in patients with breast cancer. Arch Phys Med Rehabil 2016; 97:953–963.

20 Laitung JK, Peck F. Shoulder function following the loss of the latissimus dorsi muscle. Br J Plast Surg 1985; 38:375–379.