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Quality of life and Shoulder Function after Latissimus Dorsi Breast Reconstruction

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Title

Quality of life and Shoulder Function after Latissimus Dorsi Breast Reconstruction

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Meeting Presentation

This work was presented at the Plastic Surgery Congress of the Australian Society of Plastic Surgeons in June 2017 in the Gold Coast, Australia.

Summary

Background

Breast reconstruction using a latissimus dorsi flap impacts one of the principal muscles of the shoulder. There is therefore concern that this procedure could impair shoulder function. The primary objective of this study was to study the effect of breast reconstruction using the latissimus dorsi flap on patient reported shoulder function and quality of life, compared to women who underwent total mastectomy without reconstruction.

Methods

A case-controlled cross-sectional study was conducted using the validated Breast-Q questionnaire and a functional back and shoulder questionnaire. Questionnaires were mailed to women who had undergone latissimus dorsi flap breast reconstruction (n=100) and women who had undergone total mastectomy without reconstruction (n=121). The responses from the 2 groups were compared, and results were analysed with t-test and Pearson's Correlation.

Results

Responses were received from 119 patients (60 latissimus dorsi patients and 59 mastectomy alone patients). Latissimus dorsi flap patients had significantly higher Breast-Q scores for all quality of life domains when compared to mastectomy alone patients. There was, however, no significant difference in functional back and shoulder scores between the two groups. Latissimus dorsi flap patients also scored highly for satisfaction with outcome and satisfaction for the 'back'.

Conclusion

Patients report high levels of satisfaction following Latissimus dorsi flap breast reconstruction. This type of reconstruction did not adversely impact back and shoulder function.

Keywords

Breast reconstruction; Latissimus dorsi; Breast-Q; Total mastectomy; Shoulder function

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Introduction

The latissimus dorsi (LD) musculocutaneous flap was first described in the early 1900's by Italian surgeon Iginio Tansini. This flap has since become widely used in breast reconstruction, head and neck reconstruction, free flap reconstruction, and chest wall coverage.¹ Breast reconstruction using the LD flap is one of the principal options for the reconstruction of post-mastectomy defects. It is a safe procedure and provides aesthetically pleasing results.²⁻⁴

The LD muscle, in its interaction with other muscles of the shoulder, plays an important role in shoulder adduction, extension, and internal rotation, as well as scapular depression and lateral flexion of the torso.⁵ Daily activities that rely on the function of the LD include swimming, climbing stairs, rising with the aid of the arms, and walking on crutches.⁶⁻⁹ There is therefore concern that the LD muscle flap procedure may impair shoulder function.

There are a number of studies in the literature reporting that transfer of the LD muscle causes anywhere from no functional deficit to significant functional deficit of the shoulder joint. Most studies agree however that the functional deficit in the shoulder following transfer of the LD muscle is worst in the first three to six months following surgery, and recovers close to baseline at the one year mark.¹⁰⁻¹⁵ However, some functional studies have also found objective loss of torque strength of the shoulder a few years after surgery.^{16,17}

The primary objective of this study was to study the effect of breast reconstruction using the LD flap on patient reported shoulder function, as well as quality of life, using the Breast-Q questionnaire, compared with a control group of women who underwent total mastectomy without breast reconstruction. Women who had mastectomy without reconstruction were chosen as a control group as surgical

treatment for breast cancer in itself has been theorised to affect shoulder mobility, possibly from scarring, tightness of the pectoralis muscle, or altered scapular kinetics.^{13,18}

Patients and Methods

This study was designed as a case controlled, cross-sectional study to compare women who have had LD flap breast reconstruction following mastectomy, and women who have had mastectomy alone without breast reconstruction.

Patients who underwent LD flap breast reconstruction, as well as those who underwent mastectomy alone from April 2007 to March 2015 were identified from the Flinders Breast Reconstruction database, and the Flinders Breast Unit database respectively. Patients who were deceased, as well as mastectomy patients who had subsequently undergone breast reconstruction were excluded from the study. Demographic data such as time since surgery, age, laterality of procedure, and mailing address were recorded in an Excel spreadsheet (Microsoft, Redmond, WA, USA).

All LD flap breast reconstructive procedures at our institution are performed by two plastic surgeons. The first surgeon ([Surgeon 1](#)) employs the extended technique (harvesting the overlying fat), even when used in combination with a tissue expander, always dividing the tendinous insertion of the muscle, but not the thoracodorsal nerve. The second surgeon ([Surgeon 2](#)) employs the extended technique only when used in a purely autologous reconstruction without the use of a tissue expander, partially divides the tendinous insertion of the muscle, and divides the thoracodorsal nerve routinely.

Breast-Q questionnaires were mailed out to patients, along with participant information sheets and reply paid envelopes. The Breast-Q is a validated patient-

reported outcome measure that consists of a number of versions of the questionnaire for different conditions. The questionnaires contain different modules, which can be analysed across different conditions.¹⁹ LD flap patients were given the post-operative reconstruction version, as well as satisfaction with back questionnaires (originally devised for the National Mastectomy and Breast Reconstruction Audit²⁰), and mastectomy patients were given post-operative mastectomy questionnaires. Both groups were also given the functional back and shoulder module of the Breast-Q. A second round of questionnaires were mailed out to non-responders after two months.

The raw data from the returned questionnaires were converted into domain scores (0 – 100) using the QScore (Memorial Sloan Kettering Cancer Institute, New York, USA) software programme. The domains scored included Satisfaction with Breasts, Satisfaction with Outcome (LD flap only), Psychosocial Well-being, Physical Well-being (Chest), Sexual Well-being, Satisfaction with Back (LD flap only), and Functional Back and Shoulder. Patients who did not complete any particular domain were not scored for that domain, but they were still scored for other domains they completed, as the domains are independent of each other.

Ethics approval was obtained for this study from the Southern Adelaide Clinical Human Research Ethics Committee (approval number 25.15). Data was stored on a password protected hospital server. The STROBE statement and checklist (Institute of Social and Preventative Medicine, University of Bern) were used in the design of this study and preparation of the results.

Statistical Analysis

Analysis of data was performed using IBM SPSS statistical software v23.0 (IBM Corp., North Castle, NY, USA). Descriptive statistics, including means and 95%

confidence intervals were used to compare the LD flap and mastectomy alone groups. Categorical data were analysed with Chi-Square tests. Continuous data were analysed with t-tests, and correlations were analysed using Pearson's Correlation. A value of $p < 0.05$ was considered to be statistically significant for all statistical tests used in this study.

Results

Questionnaires were sent to 100 women who had undergone LD flaps and 121 patients who underwent mastectomy alone. After two rounds of mailing questionnaires, 60 out of 100 women who had undergone LD flaps, and 59 out of 121 women who had undergone mastectomy without reconstruction returned completed questionnaires.

The demographic data of the patients are presented in Table 1. Patients in the mastectomy only group were significantly older than those in the LD flap group, with a median age of 62 vs 51. The LD flap group also underwent significantly more bilateral procedures when compared with the mastectomy alone group. There were no significant differences in the mean time since surgery between the two groups. The majority of women in either group had some form of axillary surgery, sentinel lymph node biopsy (SLNB), or axillary clearance. The difference of axillary surgery rates approached, but did not meet statistical significance between the two groups.

Axillary surgery data were not available for 25 women in the study.

[In this study, Surgeon 1 performed the reconstruction on 85 patients, and Surgeon 2 performed the reconstruction on 15 patients.](#)

Breast-Q Scores

Patients who underwent LD flap breast reconstruction attained significantly higher mean scores than patients who underwent mastectomy alone in the domains

of 'Satisfaction with Breast', 'Psychosocial Well-being', 'Physical Well-being (Chest)', and 'Sexual Well-being' (Table 2). There was no significant difference in the mean scores for both groups in the domain of 'Functional Back and Shoulder'.

Patients who underwent LD flap breast reconstruction were also generally satisfied with their outcomes. They scored a mean score of 75.42 (68.88 – 81.96) for the domain 'Satisfaction with Outcome'. There were also high levels of satisfaction with the appearance of their back following surgery, with a mean score of 81.18 (74.90 – 87.46) for the domain 'Satisfaction with Back'.

To ensure that time since surgery and the patient's age at surgery did not have an effect on the Breast-Q scores, correlations were tested with a Pearson Correlation (Table 3). There was no significant correlation between the time since surgery or patient's age at surgery and the scores for the domains of 'Satisfaction with Breasts', 'Psychosocial Well-being', 'Physical Well-being (Chest)', 'Sexual Well-being', and 'Functional Back and Shoulder'.

Tables 4 and 5 illustrate the various Breast-Q domains in the mastectomy only group and LD flap group respectively stratified according to the laterality of the procedure. There were no significant differences in Breast-Q scores in patients having a unilateral or bilateral procedure.

When patients within the LD flap group were stratified according to the timing of breast reconstruction, there were no significant differences across the various Breast-Q domains between patients who underwent immediate breast reconstruction and those who underwent delayed or mixed timing reconstruction (Table 6).

The functional back and shoulder scores were also analysed based on status of axillary surgery (Table 7). The mean scores trended downwards based on the

extent of axillary surgery, from no axillary surgery to axillary clearance, but the differences were not statistically significant.

Responses were received from 53 patients operated on by Surgeon 1, and 5 patients operated on by Surgeon 2. There was no significant difference in the mean functional back and shoulder score between the two groups (69.34 vs. 66.40, $p = 0.77$).

The demographic data for non-responders is summarised in Table 8. There were no significant differences between responders and non-responders in either the mastectomy only group or the LD flap group.

Discussion

This study has shown that LD flap breast reconstruction yields a significant improvement in quality of life following reconstruction, compared to women who underwent mastectomy without breast reconstruction. This is consistent with the published literature, with one study finding women who had mastectomies without breast reconstruction to have the lowest satisfaction scores out of women undergoing mastectomies without breast reconstruction, breast conserving surgery, or breast reconstructive surgery. Additionally, women who received LD flap breast reconstruction did not demonstrate any significant difference in satisfaction scores when compared to women who underwent breast conserving surgery.²¹

Patients who underwent LD flap breast reconstruction also reported high levels of satisfaction with the appearance of their back, despite the long scar that results from this surgery. This was similar to findings of the National Mastectomy and Breast Reconstruction Audit conducted by the National Health Service (NHS) in England, which found about 1 in 10 women were bothered by the appearance of their back most or all of the time.²⁰

The NHS audit also found that around 20% of patients who underwent LD flap breast reconstruction reported issues with activities involving use of their back or shoulder muscles most or all of the time.²⁰ In this study, there were no significant differences in patient reported outcomes of back and shoulder function in women who underwent LD flap breast reconstruction and those who underwent mastectomies without breast reconstruction. One possible reason for the variation of back and shoulder function following LD flap breast reconstruction could be the different technical modifications some surgeons apply. For example, some surgeons divide the insertion of the muscle to the humerus, and some do not. Some surgeons also divide the thoracodorsal nerve that supplies the muscle.²² Differences in technique could account for differences in outcomes, and future studies could evaluate this possibility.

A prospective study conducted by de Oliveria et al. found that shoulder function decreased by about a third immediately after surgery in either patients who underwent mastectomy without breast reconstruction or who underwent mastectomy with immediate LD flap breast reconstruction. However at the one-year mark, patients who underwent LD flap breast reconstruction were found to have superior shoulder flexion and abduction when compared to those who underwent mastectomy without reconstruction. The authors hypothesized that the tissue manipulation performed during LD flap reconstruction, along with the extra skin provided by the flap helped reduce tissue adhesion, contributing to greater shoulder mobility.^{23,24}

Even though the LD muscle is a significant muscle of the shoulder joint, its removal has not been found to detrimentally affect shoulder function, as other muscles of the shoulder, such as teres major often compensate for the loss of the LD muscle over time.⁷ A majority of studies have found that there may be an early

deterioration in shoulder function following breast reconstruction using the LD flap, but most patients recover near normal shoulder function in the long term. A common recommendation in the literature is the significant role physiotherapy plays in the recovery period following surgery in allowing shoulder function to return as close to normal as possible.^{9,11,25}

Our study also found that LD flap patients had high scores for Satisfaction with Outcome, which is what has been found similarly in the literature. Dutra et al. reported a 92% satisfaction rate with the operation and 90% of patients would recommend the surgery to someone else.²⁶

This study also found no difference in Breast-Q scores between patients who received immediate or delayed breast reconstruction. This could be due to the cross-sectional nature of the study and some time has passed since the operation for most patients. The benefits of immediate breast reconstruction have been discussed previously, with patients experiencing lower psychological morbidity following mastectomy with immediate breast reconstruction.²⁷

In our institution, routine physiotherapy is not offered to patients undergoing mastectomy of LD flap reconstruction. Axillary surgery in the treatment of breast cancer is well known to cause morbidity of arm and shoulder function, commonly causing restricted shoulder mobility, oedema, pain, and numbness.^{28,29} Post-operative physiotherapy has been shown to improve shoulder function and quality of life following breast cancer surgery, and is certainly worthy of consideration at our institution.^{30,31}

Due to the cross-sectional nature of this study, there are a few limitations to this study. Firstly, the patients completed the questionnaires at varying time points following their surgery. We have tried to negate this factor by finding no correlation

between time since surgery and the Breast-Q scores. Secondly, it would be useful to obtain scores from different time points in a patient's treatment to assess the influence the treatment has on their score, which could be an area of further study.

Another potential source of bias is the significantly older age of the mastectomy group. Age related impairment of shoulder function could cause a lower patient reported back and shoulder function score, as reflected by the negative correlation coefficient in Table 3, although not statistically significant, a larger population will need to be studied to provide more statistical power.

There is also a potential selection bias between responders and non-responders to the postal questionnaires. Patients who complete questionnaires may be more likely to either be very satisfied or very dissatisfied.³²

Conclusion

Our study has found that women who undergo LD flap breast reconstruction have a significantly higher quality of life when compared to women who undergo total mastectomy without breast reconstruction. Although there is a theoretical detriment to shoulder function after harvesting the LD for use in breast reconstruction, there is no significant difference in patient reported shoulder function between the two groups of women. There are also high levels of satisfaction with the aesthetics of the back despite scarring from harvesting the LD. LD flap breast reconstruction is therefore safe and improves the quality of life of women following total mastectomy.

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None

Conflict of Interest

None

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Table Legend

Table 1. Demographic data

Table 2. Breast-Q Scores in different domains vs type of surgery

Table 3. Pearson Correlation between time since surgery and Breast-Q scores

Table 4. Breast-Q scores in different domains in the mastectomy alone group separated by laterality of procedure

Table 5. Breast-Q scores in different domains in the latissimus dorsi group separated by laterality of procedure

Table 6. Breast-Q scores in different domains in the latissimus dorsi group separated by timing of reconstruction

Table 7. Demographic data of non-responders

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Table 1. Demographic data

	Mastectomy Group (n = 121)	Latissimus Dorsi Group (n = 100)	Significance of Difference Between Groups
Median Age (Range)	62 (34 – 87)	51 (32 – 73)	$p < 0.001$
Mean Time since Surgery (months)	47.16	49.11	$p = 0.56$
Laterality			
Unilateral	104	64	$p < 0.001$
Bilateral	17	36	
Axillary Surgery			$p = 0.06$
None	9	12	
SLNB	48	20	
Axillary Clearance	64	43	

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Table 2. Breast-Q Scores in different domains vs type of surgery. All figures shown are mean (95% confidence interval, lower bound – upper bound)

	Satisfaction with Breasts	Psychosocial Well-Being	Physical Well-Being (Chest)	Sexual Well-Being	Functional Back and Shoulder
Mastectomy Group (n = 59)	51.29 (46.22 – 56.35)	64.34 (58.99 – 69.69)	67.90 (63.73 – 72.06)	42.20 (35.40 – 49.00)	65.97 (61.69 – 70.25)
Latissimus Dorsi Group (n = 60)	67.20 (60.94 – 73.46)	78.35 (72.63 – 84.07)	74.50 (70.01 – 78.99)	59.42 (53.54 – 65.29)	68.17 (62.25 – 74.09)
Significance of Differences Between Groups	p < 0.001	p < 0.01	p < 0.05	p < 0.001	p = 0.55

Table 3. Pearson Correlation between time since surgery and Breast-Q scores

	Satisfaction with Breasts	Psychosocial Well-Being	Physical Well-Being (Chest)	Sexual Well-Being	Functional Back and Shoulder
Pearson Correlation Coefficient with Time since Surgery	0.081	0.108	0.045	0.174	0.002
Level of Significance	p = 0.38	p = 0.24	p = 0.63	p = 0.10	p = 0.99
Pearson Correlation Coefficient with Age	-0.084	0.053	-0.094	0.029	-0.139
Level of Significance	p = 0.36	p = 0.57	p = 0.31	p = 0.78	p = 0.13

Table 4. Breast-Q scores in different domains in the mastectomy alone group separated by laterality of procedure. All figures shown are mean (95% confidence interval, lower bound – upper bound)

	Satisfaction with Breasts	Psychosocial Well-being	Physical Well-being (Chest)	Sexual Well-being	Functional Back and Shoulder
Unilateral (n = 46)	50.87 (44.93 – 56.81)	64.15 (58.30 – 70.00)	68.13 (63.15 – 73.11)	45.57 (38.20 – 52.94)	64.89 (59.67 – 70.11)
Bilateral (n = 13)	52.77 (41.94 – 63.60)	65.00 (50.43 – 79.57)	67.08 (58.99 – 75.17)	32.10 (15.28 – 48.92)	69.77 (63.00 – 76.54)
Significance of Differences Between Groups	p = 0.76	p = 0.90	p = 0.84	p = 0.08	p = 0.35

Table 5. Breast-Q scores in different domains in the latissimus dorsi group separated by laterality of procedure. All figures shown are mean (95% confidence interval, lower bound – upper bound)

	Satisfaction with Breasts	Satisfaction with Outcome	Psychosocial Well-being	Physical Well-being (Chest)	Sexual Well-being	Satisfaction with Back	Functional Back and Shoulder
Unilateral (n = 38)	65.11 (56.38 – 73.83)	74.08 (65.38 – 82.77)	78.37 (70.50 – 86.24)	74.66 (69.23 – 80.09)	60.80 (52.23 – 69.37)	80.63 (71.60 – 89.66)	68.47 (60.47 – 76.48)
Bilateral (n = 22)	70.82 (62.08 – 79.55)	77.73 (67.24 – 88.21)	78.32 (69.82 – 86.81)	74.23 (65.73 – 82.72)	56.72 (51.03 – 62.41)	82.14 (74.08 – 90.20)	67.64 (58.44 – 76.83)
Significance of Differences Between Groups	p = 0.71	p = 0.60	p = 0.99	p = 0.93	p = 0.42	p = 0.80	p = 0.89

Table 6. Breast-Q scores in different domains in the latissimus dorsi group separated by timing of reconstruction. All figures shown are mean (95% confidence interval, lower bound – upper bound)

	Satisfaction with Breasts	Satisfaction with Outcome	Psychosocial Well-being	Physical Well-being (Chest)	Sexual Well-being	Satisfaction with Back	Functional Back and Shoulder
Immediate (n = 16)	65.25 (54.55 – 75.95)	74.81 (61.07 – 88.55)	82.38 (72.28 – 92.47)	76.56 (68.99 – 84.13)	62.44 (51.47 – 73.41)	77.56 (63.88 – 91.24)	66.06 (57.46 – 74.67)
Delayed or Mixed (n = 44)	67.91 (60.08 – 75.74)	75.64 (67.90 – 83.37)	76.89 (69.82 – 83.95)	73.75 (68.13 – 79.37)	58.11 (50.86 – 65.36)	82.50 (75.21 – 89.79)	68.93 (61.32 – 76.55)
Significance of Differences Between Groups	p = 0.71	p = 0.91	p = 0.40	p = 0.58	p = 0.50	p = 0.49	p = 0.67

Table 7. Functional Back and Shoulder scores stratified by axillary surgery (95% confidence interval, lower bound – upper bound)

	No Axillary Surgery (n = 14) {a}	Sentinel Lymph Node Biopsy (n = 36) {b}	Axillary Clearance (n = 51) {c}
Functional Back and Shoulder Score	72.36 (62.11 – 82.60)	68.14 (62.70 – 73.58)	61.96 (56.04 – 67.88)
Significance of Difference Between Groups	{a} & {b} – p = 0.42 {a} & {c} – p = 0.10	{b} & {c} – p = 0.14	

Table 8. Demographic data of non-responders

	Mastectomy Alone Group			Latissimus Dorsi Group		
	Responders (n = 59)	Non- Responders (n = 62)	Significance of Difference Between Groups	Responders (n = 60)	Non- Responders (n = 40)	Significance of Difference Between Groups
Median Age (Range)	63 (34 – 83)	62 (36 – 87)	p = 0.24	52 (32 – 73)	49.50 (32 – 70)	p = 0.51
Mean Time Since Surgery (Months)	45.58	48.66	p = 0.49	50.63	46.83	p = 0.45