



Audit

An audit of the incidence of arm lymphoedema after prophylactic level I/II axillary dissection without division of the pectoralis minor muscle

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Lymphoedema is reported to occur in approximately one in four women following curative treatment for breast cancer. Reported rates are almost exclusively for level 1,2,3 axillary clearance with few data for the current practice of level 1,2 dissections. Swelling can affect the whole upper limb but frequently will remain restricted to hand, forearm or upper arm. The aims of this study were to determine incidence after level 1,2 dissection, degree and site of swelling and risk factors which might determine such incidences. Results were available on 198 patients. The cumulative prevalence of lymphoedema after level 1,2 dissections was 14% in the arm, 12% in the forearm and 16% in the hand, assuming a circumference difference of more than 5% indicated lymphoedema. Moderate lymphoedema representing more than 10% circumference difference was found in 1% (arm), 3.5% (forearm) and 0.5% in the hand. Risk factors for lymphoedema were experience of the surgeon (upper arm only), dominant limb (forearm only) and right-sided cancer treatment (for hand only). When lymphoedema in any site was considered, right-sided treatment and nodal status were independently significant.

Conclusions: This study demonstrates that lymphoedema is a common complication following level 1,2 dissection. Whole limb volume is often considered the main outcome measure for detecting lymphoedema and determining success of treatment, yet swelling may be restricted to regions of the limb and site specific circumference measurements are therefore recommended. Pre- and postoperative circumference measurements are likely to be the most sensitive way of determining presence of lymphoedema following surgery for breast cancer.

Key Words: Lymphoedema – Breast cancer – Axillary dissection – Radiotherapy

Past publications reporting and commenting on the incidence of arm lymphoedema have largely been following level 1,2,3 axillary clearance¹⁻⁷ with scarce data for level 1,2 dissection.^{8,9} Degree and site of swelling can be variable, yet there are no publications giving detail on the degree of lymphoedema and how it is affecting hand,

forearm or upper arm. Any one of these sites may be involved, or alternatively the whole limb may be swollen.

At present it is not possible to predict who is likely to develop lymphoedema. Risk factors include extent of surgery, postoperative complications such as infection, and obesity, but reports are anecdotal. The aims of this

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study were to: (i) determine the incidence of lymphoedema associated with a limited axillary dissection (*i.e.* level 1,2); (ii) determine the degree of swelling; (iii) determine the incidence at various sites in the limb (*i.e.* upper arm, forearm or hand); (iv) assess any correlation between the patient's perception of swelling and objective measurement of oedema; and (v) determine what risk factors might be significant in manifesting swelling.

Patients and Methods

A cross-sectional retrospective analysis of 201 patients who underwent a level 1,2 axillary dissection without division of the pectoralis minor was performed. All patients were assessed at least 6 months after treatment.

The medial limits of the axillary dissection were the medial pectoral vessels and the chest wall (lower margin 1st rib). The lateral limit was the border of the latissimus dorsi. In each case, a suction drain was retained for up to 5 days. Surgery was undertaken either by the consultant or the attached specialist registrar in training. The following outcome measures were recorded.

Objective assessment of lymphoedema

The circumference of each upper limb was measured 15 cm above and 10 cm below the tip of the olecranon with the elbow fixed at 90° and the shoulder abducted at 90°. Care was taken to avoid constriction of the soft tissue by the tape. The circumference of the hand at the metacarpophalangeal joints was also measured. Differences in measurements between the operated and unoperated side were expressed both as an absolute value and as a

percentage variation. The latter was used in the statistical analysis.

Subjective assessment of lymphoedema

The patients, nurses and doctors subjective opinions on the presence or absence of swelling were recorded. The verdicts of the nurses and doctors were based on clinical inspection.

Possible risk factors

The following variables were documented for statistical correlation with lymphoedema: (i) size and grade of tumour; (ii) number of lymph nodes removed; (iii) nodal status; (iv) chemotherapy (both neo-adjuvant and adjuvant); (v) radiotherapy (chest wall, axilla, supraclavicular fossa); (vi) tamoxifen therapy; (vii) postoperative infection; (viii) postoperative seroma; (ix) side of surgery – right versus left; (x) side of surgery – dominant versus non-dominant limb; (xi) consultant or specialist registrar performing surgery; and (xii) mastectomy or wide local excision.

Statistical analysis

Variables were investigated in a univariate analysis and significance was assessed by the chi-squared test with Yates' correction. A 5% two-sided level of significance was used. The independent effect of variables was investigated in a multivariate logistic regression analysis (using a step-up procedure). Variables were included in the model if the level of significance was $P < 0.1$. The relative risk (RR) of lymphoedema was calculated for each of the variables.

Table 1 Patient characteristics

Patients		201
Median age (range)		55 (27–91) years
Handedness	Right:left	186:15
Side of operation	Right:left	103:98
	Dominant:subordinate	108:93
Surgeon	Consultant:registrar	142:59
Operation	Mastectomy + AD	29
	Mastectomy + AD + LD flap	11
	WLE + AD	141
	Axillary dissection	20
Grade	I/II/III/not known	36/94/52/19
Nodal status	+ve/-ve/not known	79/122/0
No. of nodes tested	Mean ± SD	12.7 ± 4.1
	Median	12 (1–25)*
Chemotherapy	Adjuvant/neo-adjuvant	77/38
Radiotherapy	Chest/axilla/SCF	163/17/43
Tamoxifen		183
Complications	Seroma	77
	Infection	45**

WLE, wide local excision; AD, axillary dissection; LD, latissimus dorsi; SCF, supraclavicular fossa.

*Patient with 'one node' had a single mass of fused lymph nodes.

**Based on retrospective assessment of use of antibiotics.

Results

The median follow-up period was 21 months (range, 6–55 months) with an inter-quartile range of 14–30 months. The mean follow-up period was 23 months ± 12 months (SD). Demographic data of patients and details of variables for analysis can be seen in Table 1.

Subjective lymphoedema

Data were complete on 199 patients. Twenty (10%) perceived swelling at least at one site in the limb. Circumference measurements (> 5% increase) confirmed lymphoedema in 50% of subjects who perceived swelling; conversely, 31% of subjects had objective lymphoedema without knowing. The presence of swelling was confirmed on inspection by the doctor or nurse in 9 cases, but not in the other 11.

Objective lymphoedema

Data were complete on 198 patients. The degree and site of lymphoedema is reported in Table 2. We believe that percentage variations in measurements are more relevant

Table 2 Incidence of lymphoedema at three levels of measurement according to various definitions

Degree of lymphoedema	15 cm above olecranon	10 cm below olecranon	MCP joint
0.0–0.9 cm (none)	68%	71%	83%
1.0–1.9 cm (minimal)	18%	18%	16%
2.0–2.9 cm (mild)	12%	8%	0.5%
3.0–3.9 cm (moderate)	1%	2.5%	0%
4.0–4.9 cm (serious)	0.5%	0.5%	0%
< 5% (none)	86%	88%	84%
5–9.9% (mild/moderate)	13%	8.5%	16%
≥ 10% (moderate/serious)	1%	3.5%	0%

Table 3 Incidence of lymphoedema

	Upper arm		Forearm		Hand		Any site	
	n	%	n	%	n	%	n	%
Incidence of lymphoedema (>5 %)	27	13.6%	24	12.1%	32	16.2%	65	32.8%
Mild/moderate (> 5%, < 10%)	25	12.6%	17	8.6%	31	15.7%	55	27.8%
Moderate/severe (> 10%)	2	1.0%	7	3.5%	1	0.5%	10	5.1%

Table 4 Relative risk of lymphoedema

	Upper arm > 5%	Forearm > 5%	Hand > 5%	Any site > 5%
Side of operation (right:left)		3.1 (P = 0.03)	4.0 (P = 0.002)	3.2 (P < 0.001)
Surgeon (registrar:consultant)	3.2 (P = 0.009)		2.2 (P = 0.07)	2.0 (P = 0.05)
Side (dominant:subordinate)		3.8 (P = 0.01)	3.7 (P = 0.004)	2.9 (P = 0.001)
Nodal status (+ve:-ve)				2.0 (P = 0.03)
Chemotherapy (yes:none)			2.0 (P = 0.09)	

than the absolute difference in centimetres as the latter does not take into consideration the volume of the limb. The overall prevalence for mild/moderate limb lymphoedema (> 5%) determined for any one of the three sites was 32.8% (Table 3). The most common single site was the hand, followed by the arm and then the forearm. However, there were no cases of lymphoedema affecting the whole arm (*i.e.* all sites swollen in one limb). If > 2 cm difference for any one site is used as the criterion for lymphoedema, then the rate is 22%.

Risk factors

Independent variables that significantly correlated with objective lymphoedema are showed in Table 4.

Discussion

This study would suggest that after level 1,2 axillary dissection the incidence of moderate/serious lymphoedema is probably lower than the previously published results after level 1,2,3 dissections. However, mild/moderate lymphoedema (> 5%, < 10% difference) still occurs in 27.8% of patients and moderate/serious lymphoedema (> 10% difference) in 5.1% of patients for any one of three sites (upper arm, forearm or hand). If > 2 cm difference for any one site is used as the criterion for lymphoedema, then the rate decreases to 22%. Subjective assessment was not a good indicator of the presence of lymphoedema. There was poor correlation with objective measurement of swelling and disagreement between the patient’s perception and that of the professionals.

In trying to identify risk factors for the onset of lymphoedema (other than the level of axillary surgery) positive nodal status for cancer, dominant limb and right-sided treatment were significant positives. A dominant limb

conveyed a 4-fold relative risk compared to the non-dominant limb for forearm swelling. The study of normal subjects has showed that dominant limbs have a volume which is 3.9% greater than non-dominant limbs;¹⁰ therefore, it is reasonable to assume that > 5% difference is unlikely to be produced by dominance alone. Right-sided cancer treatment increased risk of forearm swelling 3-fold. Surgical expertise predictably influenced risk with lymphoedema being less likely if the consultant undertook surgery. It was surprising that previously identified risk factors such as radiotherapy, mastectomy (as opposed to wide local excision) and infection did not correlate with swelling. Length of follow-up may have been relevant here as radiotherapy can manifest lymphoedema many years later.¹¹

With the recent introduction and assessment of sentinel node biopsy, this practice might reduce the incidence of lymphoedema further. However, it would be unwise to think it would stop it. Experience with melanoma has shown lymphoedema risk to still be of the order of 5%.¹²

Conclusions

This study has established that arm swelling remains a common problem with the current practice for breast cancer treatment. Identifying early and, therefore, mild lymphoedema is important because it does not disappear and can only get worse with time. At present, no definitive cure exists and, therefore, limiting the risks as well as the progression of swelling are of prime importance. It is critical that the presence or absence of lymphoedema is monitored during follow-up after breast cancer therapy. Early intervention with treatment such as an elastic sleeve or advice on life-style may not only prevent progression, but might return the limb to within normal limits. From results presented here, objective measurement is much more reliable than subjective

assessment. A better study design would be to investigate patients prospectively and to include limb volume measurements prior to axillary surgery.¹³ This would overcome the problem due to natural differences in size, which could be mistaken for mild lymphoedema.

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