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Predictors of Lymphedema for Patients Undergoing Breast Cancer Surgery



Karen K. Swenson, RN, PhD
Mary Jo Nissen, PhD, MPH
Joseph W. Leach, MD
Janice Post-White, RN, PhD

Park Nicollet Institute
Minneapolis, MN
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Why study lymphedema?

- Axillary Lymph Node Dissection (ALND) is a common surgery for breast cancer
- Upper-extremity lymphedema frequently occurs following ALND (15 - 30% of cases)
- Lymphedema is often chronic and can lead to disability, body image concerns and pain.

Disease & Treatment Risk Factors

- Number of axillary nodes removed
- Axillary radiation therapy
- Positive nodes (?)
- Breast radiation therapy (?)
- Venipuncture (?)
- Arm, breast or axillary infections (?)
- Chemotherapy (?)

Patient Risk Factors

- Obesity
- Hypertension (?)
- Age (?)
- Airline travel (?)
- Weight-bearing activity (?)
- Repetitive motion activities (?)

Mechanisms of Lymphedema

- Axillary surgery causes disruption in lymphatic vessels in the axilla
- Radiation therapy in the axillary bed can cause edema and fibrosis
- Protein-rich fluid accumulates in the soft tissues.
- Oncotic pressure rises causing progression of edema.

Specific Aims

- Identify risk factors for lymphedema among women who have had axillary surgery for breast cancer
- Evaluate the amount of interference with daily life caused by lymphedema



Methods

- Matched case-control study
- Cases were identified in lymphedema clinics and cancer centers
- Controls were identified using the oncology registry
- Controls were matched to each case on type of axillary surgery and surgery date



Eligibility - Cases

- Clinical diagnosis of lymphedema
- Previous axillary surgery for breast cancer
- Able to speak and write English
- Able and willing to give consent

Eligibility - Controls

- No lymphedema diagnosed
- Patient reports no arm swelling
- Previous axillary surgery for breast cancer
- Able to speak and write English
- Able and willing to give consent

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Sample Size (94 cases/94 controls)

Institution	No. of Cases
Park Nicollet Clinic	73
Fairview-University	7
Fairview-Southdale	5
North Memorial	5
St. John's- HealthEast	4

Arm Measurements

- Measure arm circumference for both arms every 4 cm from wrist to shoulder
- Sum of circumferences (girth) was added and the % difference between unaffected and affected arms was calculated.
- Formula: % difference in arm volume = $\frac{\text{Difference in girth between the two arms}}{\text{Girth of unaffected arm}}$

MASS Questionnaire

- Measure of Arm Symptom Survey (MASS)
Patient-completed questionnaire
- Likert-type questions with 5-point scales
- Participants rate severity of arm swelling and the degree of interference with life activities
- Review of risk factors that may contribute to lymphedema.

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How much swelling in your arm or hand (lymphedema) have you had in the past two weeks?

A. No swelling

B. Mild swelling

C. Moderate swelling

D. Severe swelling

E. Very severe swelling



How much has arm or hand swelling interfered with your daily life?

- A. Not at all
- B. A little bit
- C. Somewhat
- D. Quite a bit
- E. Very much



MASS Questionnaire

- Diabetes
- Hypertension
- Cigarette smoking
- Past shoulder injury
- Height/Weight - BMI
- Occupation
- Flexibility exercises
- Recreational activities
- Strength training exercises
- Medical procedures
- Airline travel

MASS Questionnaire

- Validity
 - MASS administered to an expert group
 - Pre-tested in a lymphedema educational group
- Test-Retest Reliability
 - Sent a second questionnaire to the first 24 cases within 2 weeks after the initial questionnaire was received.

Chart Review

- Nodes removed/nodes positive
- Radiation therapy
- Chemotherapy
- Surgery type and date
- Age



Data Analysis

- Univariate analyses to describe characteristics of cases and controls
- Conditional logistic regression analyses compared cases and controls on potential risk factors for lymphedema in univariate and multivariate analysis
- Spearman correlation to compare lymphedema severity and interference with daily life.

Demographic and Clinical Factors

	Cases (n=94)	Controls (n=94)
Mean age at surgery	58.4	59.5
Non-smoking status	57%	63%
Diabetes	15%	14%
Hypertension	32%	34%

Disease and Treatment Factors

	Cases (n=94)	Controls (n=94)
Dissection: ALND	92%	92%
SLND	8%	8%
Median years since surgery	3.8	3.9
Mean tumor size	3.0	2.3
Mean # of nodes removed	15.2	15.0

Treatment Factors

	Cases (n=94)	Controls (n=94)
*Type of surgery:		
Mastectomy	76%	54%
Lumpectomy	25%	46%
*Mean # of positive nodes	3.9	1.9
*Radiation to axilla	23%	9%
*Chemotherapy	84%	69%

* Significant difference between cases and controls on univariate analysis ($p \leq .01$)

Other Risk Factors

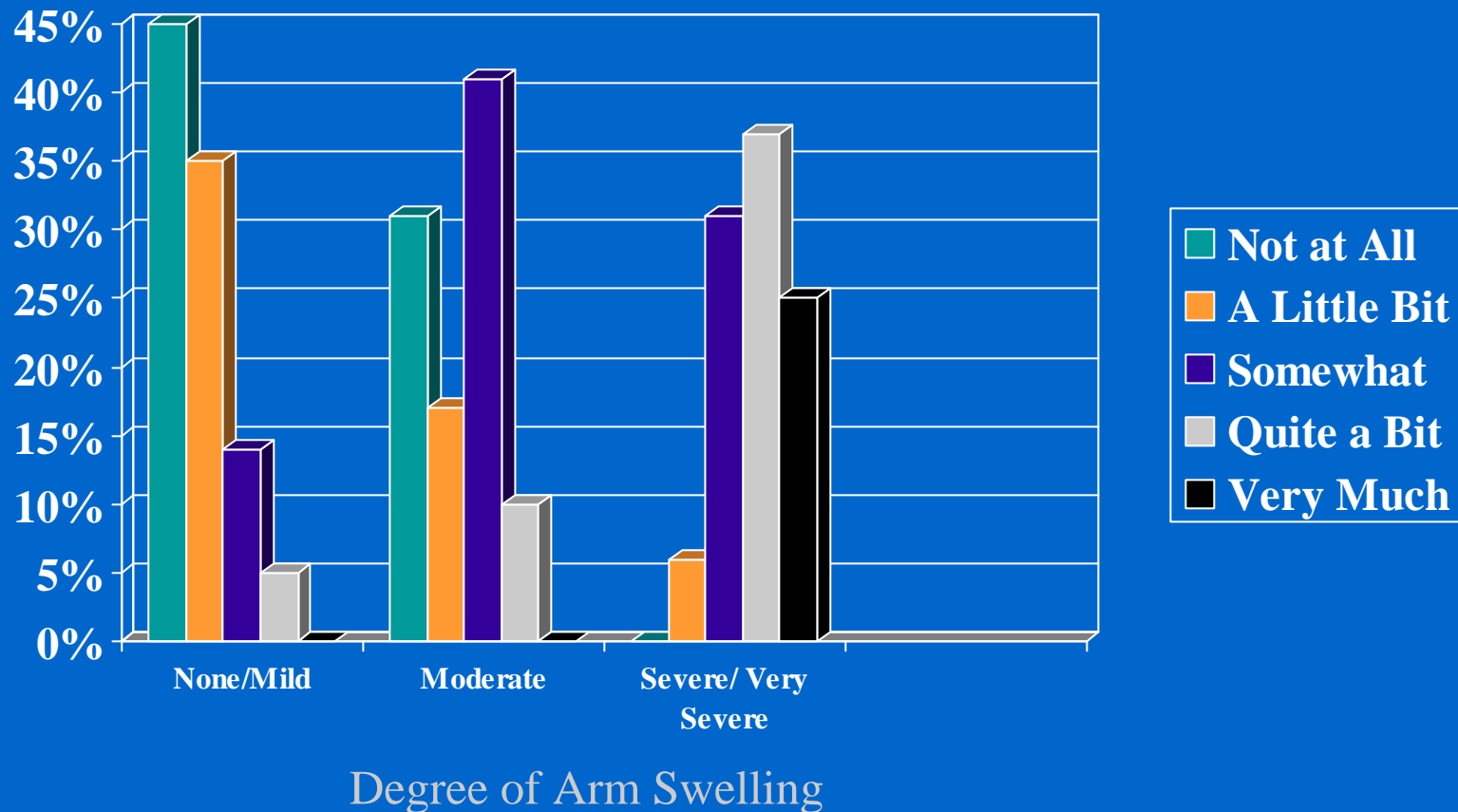
	Cases (n=94)	Controls (n=94)
*BMI \geq 25	69%	50%
*Regular strength training	12%	28%
*Air travel since surgery	50%	74%
*Evidence of cancer at last follow-up	24%	7%

* Significant difference between cases and controls on univariate analysis ($p \leq .01$)

Multivariate Analysis

Covariate	Odds Ratio	P value
Mastectomy vs. lumpectomy	2.5 (0.8 – 7.8)	.130
Number of positive nodes	1.0 (0.9 – 1.2)	.609
Radiation to axilla	1.4 (0.2 – 12.9)	.743
Chemotherapy	2.6 (0.4-15.4)	.298
Number of aspirations	1.5 (0.7 – 3.0)	.273
Overweight vs. not overweight	5.6 (1.3-24.2)	.022
Routine activity causing arm aching	1.4 (0.4-5.1)	.608
Strength training exercises	0.3 (0.1-1.3)	.114
Any air travel since surgery	0.3 (0.1 – 1.2)	.093
Evidence of cancer at last follow-up	5.8 (0.8 – 40.0)	.078

Lymphedema Interference with Daily Activities



Conclusions

- Being overweight (BMI ≥ 25) was a significant risk factor for lymphedema
- Treatment and disease-related factors such as axillary radiation, more extensive surgery, chemotherapy, and having an active cancer status were risk factors for lymphedema

Conclusions (cont.)

- Strength training, airline travel and minor injuries to the affected arm are not significant risk factors for lymphedema.
- Patients should be encouraged to continue with normal activities of daily living without fearing that they will contribute to the development of lymphedema.

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