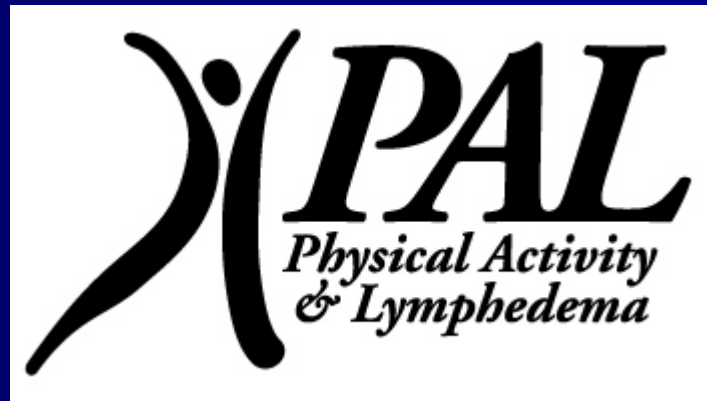


Presentation of Main Results



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DEDICATION

To the memory of Rachel Levin Troxell



Overview

- Background
- PAL study
 - Study Overview
 - Baseline characteristics
 - Results
- Next steps



Epidemiology of ARM

Lymphedema after BrCa

- 200-400,000 of the approximately 2 million BrCa survivors in the US have clinically diagnosed lymphedema (Stolberg 1998)
- The prevalence is estimated at 49% when including self-reported symptoms of lymphedema (Petrek 2000)
- Incidence varies by study
 - As low as 6% after SLNB
 - Recent publication with objective measures observed 17% incidence after SLNB (Francis 2007)



Risk factors for lymphedema secondary to cancer

- Not well-described:
 - Data from 20-year prospective cohort study of 272 BrCa survivors found:
 - Significantly associated:
 - Arm infection, injury and elevated BMI
 - Not associated:
 - Occupational and leisure-time physical activity (light, moderate and vigorous)



Issue:

- Survivors are at increased risk for chronic disease and morbidity:
 - osteoporosis, heart disease, and recurrence
- Exercise may help women:
 - regain strength, function, and range of motion after surgery
 - with re-empowerment & body image
 - ↑ quality of life after a cancer diagnosis
 - Decrease risk of chronic disease



However...

- Current clinical guidelines warn breast cancer survivors against vigorous, repetitive, or excessive upper body exercise for fear of increasing risk for lymphedema (Harris 2000)
- NLN, ACS, Komen, NCI guidelines –
 - All restrict upper body activity in women at risk for lymphedema



Rationale

- These guidelines are problematic:
 - Survivors are limited in activities and rehabilitation
 - Cannot attain the health benefits of physical activity
- There is physiological evidence that exercise may improve lymph flow and resorption



To date...

- Prior interventions have examined the effects of upper body exercise on lymphedema in BrCa survivors
 - Competitive dragon-boat racing
 - Upper body aerobic/strength training
 - No increase in incident lymphedema or increased symptoms in women with or at risk for lymphedema
- These studies have been limited by methodology
 - Case-series
 - Uncontrolled pre-post designs
 - Small randomized trials

MacVicar 1989; Brennan 1998; Harris 2000; Kolden 2002; McKenzie 2003; Waltman 2003; Turner 2004; Lane 2005; Sandel 2005; Johansson 2005; Cheema 2006; Courneya 2007



Based on these findings:

- Supervised slowly progressive controlled increase in physiological stress through strength training may be more beneficial to BrCa survivors vs. acute stress from activities of daily living
 - Analogy
 - Heart attack and shoveling snow
 - Lymphedema and lifting a heavy object



Weight Training for Breast Cancer Survivors (WTBS)

■ Study design

- 6 month randomized controlled trial

■ Participant description

- 81 recent BrCa survivors
- 4 – 36 months post-treatment
- 14 survivors had diagnosed lymphedema at baseline
 - N=7 in treatment and control groups

Ahmed et al. JCO 2006



Lymphedema outcomes

| | Tx | Cntrl | P-value |
|-----------------------|----|-------|---------|
| Incident Lymphedema | 2 | 2 | 0.54 |
| Worsening of symptoms | 0 | 4 | 0.24 |



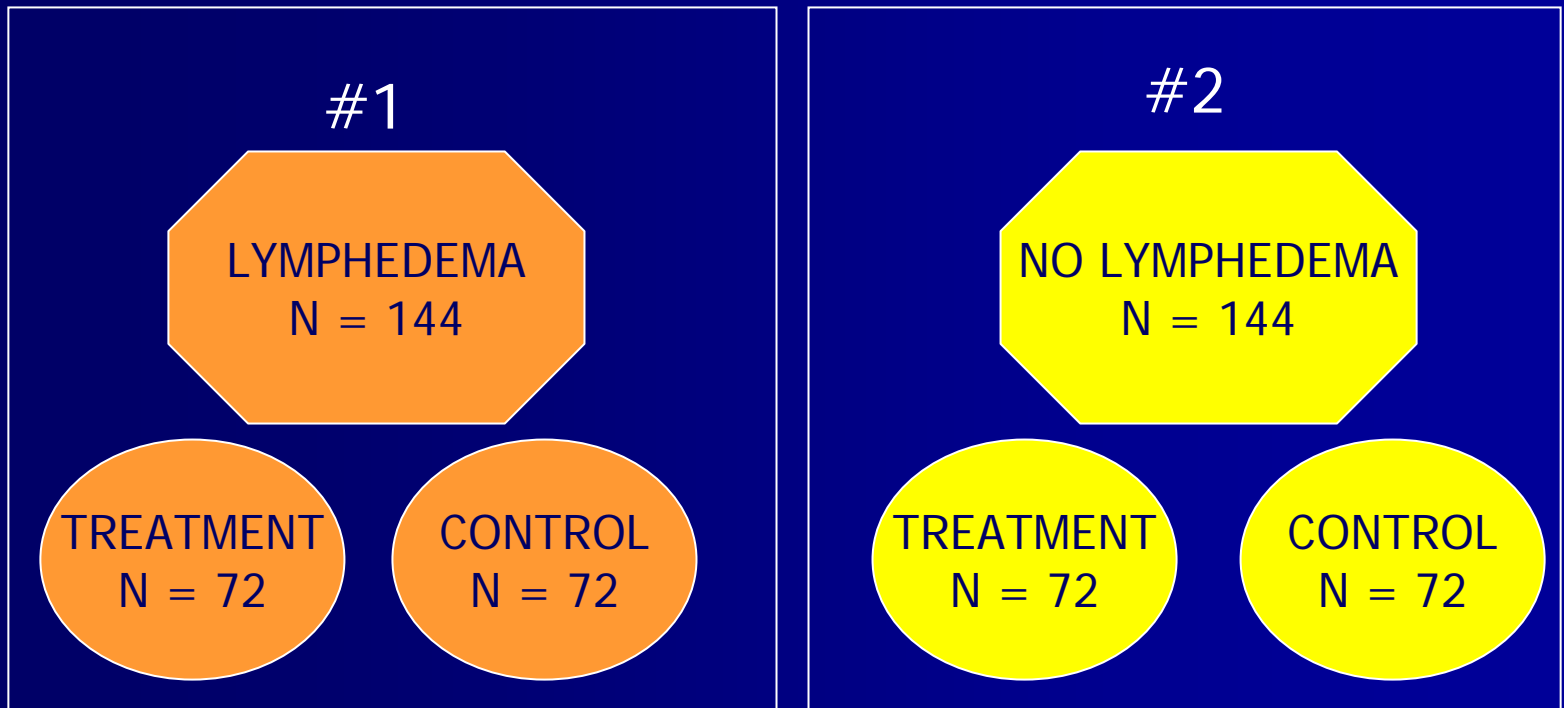
The Physical Activity and Lymphedema (PAL) Trial

R01-CA106851

- 1 year randomized controlled intervention
 - Twice weekly progressive strength training
 - Non-exercising control
- Recruitment goal = 288 BrCa survivors
- Measurements at baseline, 3, 6, 9 and 12 months
- 1/2 with, 1/2 without lymphedema at baseline
- 1-15 years post-diagnosis



PAL Design



- ❖ 1 year randomized controlled intervention
- ❖ Target = 288 Breast Cancer Survivors

Demographics

| | With Lymphedema (N=141) | | Without Lymphedema (N=154) | |
|--------------------|----------------------------|-------------------|-------------------------------|-------------------|
| | Treatment (n=71) | Control (n=70) | Treatment (n=77) | Control (n=77) |
| Age (years) | 56 | 58 | 54 | 56 |
| Education | | | | |
| HS or less | 13 | 16 | 7 | 11 |
| Some College | 26 | 24 | 28 | 23 |
| College or more | 32 | 30 | 42 | 43 |
| Race | | | | |
| White | 40 | 42 | 50 | 59 |
| Black | 28 | 26 | 19 | 17 |
| Other | 3 | 2 | 8 | 1 |



Baseline strength and body size in women WITH lymphedema

| Variables | Treatment (n=71) | Control (n=70) |
|----------------------------|------------------|----------------|
| Strength | | |
| Bench Press 1 rep max (lb) | 43 | 39 |
| Leg Press 1 rep max (lb) | 182 | 162 |
| Anthropometry | | |
| BMI (kg/m ²) | 30.99 | 29.94 |
| % body fat | 40.06 | 39.51 |
| Fat mass (kg) | 31.30 | 31.81 |
| Lean mass (kg) | 50.30 | 49.05 |



Baseline strength and body size in women WITHOUT lymphedema

| Variables | Treatment (n=77) | Control (n=77) |
|----------------------------|------------------|----------------|
| Strength | | |
| Bench Press 1 rep max (lb) | 41 | 41 |
| Leg Press 1 rep max (lb) | 170 | 181 |
| Anthropometry | | |
| BMI (kg/m ²) | 27.52 | 28.55 |
| % body fat | 37.71 | 39.26 |
| Fat mass (kg) | 28.11 | 30.56 |
| Lean mass (kg) | 46.84 | 47.30 |



Baseline Lymphedema Characteristics

| Entered Study: | Lymphedema | | No Lymphedema | |
|--|------------|-----------|---------------|-----------|
| | Treatment | Control | Treatment | Control |
| N | 71 | 70 | 77 | 77 |
| % diff water volume | 15.0 | 17.3 | 0.1 | -0.3 |
| % diff largest circumference diff | 14 | 14.7 | 3.3 | 4.0 |
| Total # symptoms endorsed on Norman Lymphedema Survey | 4.1 | 3.8 | 1.0 | 0.9 |



12 month changes!



Intervention adherence

- ❖ With lymphedema
 - o 88% average attendance
- ❖ Without lymphedema
 - o 79% average attendance



Strength changes in women WITH lymphedema

| | Treatment | Control | |
|------------------|------------|------------|----------|
| Strength Changes | % Δ | % Δ | p-value* |
| Bench Press | 29.4 | 4.06 | <0.0001 |
| Leg Press | 32.5 | 7.61 | <0.0001 |



Strength changes in women WITHOUT lymphedema

| | Treatment | Control | |
|------------------|------------|------------|----------|
| Strength Changes | % Δ | % Δ | p-value* |
| Bench Press | 36.1 | 9.82 | <0.001 |
| Leg Press | 33.8 | 9.63 | <0.001 |



% changes in body image and relationships survey

| | Treatment | Control |
|------------------------|-------------------|-------------------|
| | % Δ | % Δ |
| | Total | 12.0 ^e |
| Strength & Health | 14.9 ^e | 2.7 |
| Social Barriers | 5.4 | -1.8 |
| Appearance & Sexuality | 7.3 ^d | -0.7 |



Lymphedema outcomes in women WITH lymphedema

| | Treatment | Control | CIR (95% CI) or p-value* |
|------------------------------------|--------------|--------------|-----------------------------|
| | Mean or (%) | Mean or (%) | |
| Flare-Ups | (14%) | (29%) | 0.47 (0.23 , 0.97) |
| Prescribed treatment appts. | 8.56 | 10.26 | 0.42 |
| Interlimb difference | | | |
| 5% increase | (11%) | (12%) | 1.00 |
| 5% decrease | (19%) | (22%) | 0.68 |
| Δ in # of symptoms endorsed | -1.81 | -1.17 | 0.06 |



Cost: Intervention vs. flare-ups

- 77 prescribed flare-up appts in treatment group
- 195 prescribed flare-up appts in control group
- Cost of intervention around \$600 per woman
- Cost of additional flare-up appts in control group more than \$600 per woman



Lymphedema outcomes in women WITHOUT lymphedema

| | Treatment | Control | CIR (95% CI) or p-value* |
|---------------------------------------|----------------|----------------|-----------------------------|
| | Mean or (%) | Mean or (%) | |
| Onsets | (4.6%) | (4.4%) | 1.03 (0.22, 4.92) |
| Prescribed treatment appts. | 2 | 4 | 0.66 |
| Interlimb difference | | | |
| 5% increase | (11%) | (17%) | 0.35 |
| 5% decrease | (8%) | (12%) | 0.59 |
| Δ in # of symptoms endorsed | -0.51 | -0.42 | 0.60 |



Summary

- Twice weekly slowly progressive strength training is SAFE for breast cancer survivors who have had lymph node removal including
 - Those WITH lymphedema
 - Those AT RISK FOR lymphedema
- Risk of lymphedema flare-ups decreased by HALF
 - May save insurance companies money
- Strength improvements with this program are substantive
- Body image improved too



Now What?

- It is time to re-write clinical guidelines for exercise for breast cancer survivors with and at risk for lymphedema to include slowly progressive strength training
- Continued follow-up of PAL cohort
- Implementation at YMCAs
- Translation to lower limb lymphedema





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LYMPHEDEMA EVALUATION & TREATMENT

Penn Therapy and Fitness



Thank You!

Fighter Video

