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THE ROLE OF EXERCISE IN LYMPHEDEMA MANAGEMENT

JODI WINICOUR
PT, CMT, CLT-LANA

WHAT EVERY CLT NEEDS TO KNOW

- Intensive & Maintenance Phase Exercise Rx
- Activity Restriction Guidelines
  - Immediately post-surgery
  - For the at-risk limb in acute phase and long-term
  - For those with lymphedema already
- Exercise Guidelines
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  - Immediately post-surgery
  - During and after cancer treatments

KEEP IN MIND

- Not all lymphedema research is of the highest quality (limited sample size, too many variables, short follow up)
- Varying definitions of lymphedema.
- Best evidence available.
- “Opinion Alerts”
- Findings WILL CHANGE over time.

THE COMPONENTS OF CDT

Key Components
- Manual Lymphatic Drainage
- Compression bandaging
- Skin and nail care
- “Remedial” exercise

Two Phases of Rehabilitation
- Intensive
- Maintenance
**HISTORICAL GUIDELINES**


Remedial exercises, performed while wearing the bandages, enable muscle and joint pumps to exert their lymphokinetic effects.

**HISTORICAL GUIDELINES**


**HISTORICAL GUIDELINES**

- The bandaged extremity is subsequently guided through a series of remedial exercises aimed at promoting muscle and joint motions within an enclosed space. (WORKING PRESSURE!)
- These exercises can increase lymphatic fluid movement in available lymphatic channels aided by collateral drainage pathways. (Treatment Phase)

**HISTORICAL GUIDELINES**

Dr. Lerner. Decongestive Physiotherapy (CDP). The Ideal Treatment for Lymphedema. 1992
- Remedial lymphedema exercises for 10 minutes, twice a day
**HISTORICAL GUIDELINES**
Consensus Document of the International Society of Lymphology. 2003
- ...range of motion, exercise & compression.
- Continued “remedial” exercise.

**LERNER 1992**
- **Remedial** lymphedema exercises are performed while wearing the bandages. The patient is then asked to exercise each muscle and joint of the affected limb.
- This forces the muscles to contract against a non-yielding external force and promotes a tremendous outflow of lymph fluid from that limb. (Working Pressure!)
- As a result, after each MLD session, the limb is thinner, and after each exercise session, thinner still.

**NATIONAL LYMPHEDEMA NETWORK EXERCISE POSITION STATEMENT 2011**
- Lymphedema **remedial** exercise is a part of the treatment for lymphedema when reduction of size of a limb is necessary.
- ...involves active, repetitive, non-resistive motion of the involved body part.
- Exercise in Phase I and Phase II CDT is performed with compression as an essential part of the total (complete) reductive phase of lymphedema therapy.

**FOELDI 2003**
For optimal venous and lymphatic flow, Prof. Foeldi emphasizes the value of:
- **Full joint ROM** and **Deep breathing**
WHY DOES EXERCISE + BANDAGING HELP?

Bandages not only counterbalance elastic insufficiency, but increase tissue pressure as well.

It has been shown that there is a positive correlation between tissue pressure and lymph flow. (Working Pressure!)

Bandaging – in combination with movement – softens fibrosis and pitting edema.

Muscle contraction and elongation, and arterial pulsation, increase lymphangiomotoricity.

Foeldi 1989

DIFFERING OPINIONS

Some recommend specific sequences of exercise mimicking MLD, others recommend non-specific exercises.

Some recommend Tai Chi-like movements, some AROM and isometrics.

IDEAL EXERCISE FOR ACTIVE PHASE

- Includes active movements with bandaging (including foam) in place.
- Exercises not only the muscles of the edematous region, but also of the neck and trunk to facilitate lymph flow centrally.
- Uses gravity or light resistance throughout the range of motion to both shorten and elongate the tissues.
- Includes deep breathing.
- Increases the heart rate.

TREAT THE WHOLE PATIENT

- Maintain or improve flexibility & strength of the edematous region.
- Focus on exercises that will improve independence with dressing/bandaging.
- If possible, address general fitness and health concerns.
TYPES OF EXERCISE

17

TYPES OF EXERCISE

18

TYPES OF EXERCISE

19

TYPES OF EXERCISE

20

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WHAT IF THE “IDEAL” IS NOT POSSIBLE?

Paralysis: Passive movement and stretching.

Fatigue/low blood counts from cancer treatments: Isometrics, stretching, active movements at home.

Pool Exercise
  - When bandaging is not possible.
  - For truncal edema
  - When the patient (deconditioned, poor balance, etc.) and/or their swollen limb will benefit from increased buoyancy.

ENHANCED LYMPHATIC DRAINAGE

Studies investigating active and passive lower extremity movement used bioimpedance, lymphoscintigraphy, perometry, and tonometry to demonstrate that lymphatic drainage **improved**.

Stick et al. 1989, Moseley et al. 2004, Pereira de Godoy et al. 2004

AQUATIC EXERCISE

Benefits:
  - Buoyancy
  - Promotes relaxation
  - Isokinetic exercise reduces inflammatory response
  - Natural gradient compression with hydrostatic pressure of 22.4 mm Hg for every 12 inches of immersion

Cole 2004, Foeldi 2003

AQUATIC EXERCISE

**BEWARE!**
  - Too much too soon.
  - Some patients susceptible to hypotension upon exiting the water
  - Erythema and increased lymph load.
  - Muscle soreness with floatation-type resistance → eccentric contractions.
**COOKBOOK!**

Fifteen minutes of specific lymphedema exercises are performed every morning while still dressed in compressive bandages.

Muscle movements while bandaged can increase the volume and the pressure of lymphatic flow which may eventually lead to formation of collateral lymphatic vessels. (Maintenance Phase)

-Dicken, Lerner, Klose. 1998

(See the Guidelines and Exercises at the end of this presentation.)

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**IN THE CLINIC**

- Exercise-routine handouts for body regions. (VHI, digital photos)
- Group exercise (land, aquatics)
- Oncology-specific classes
- Non-specific exercise classes (Zumba, yoga, Nia, step aerobics, etc...)

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**HEALTHY STEPS THROUGH MOVEMENT AND DANCE**

lebedmethod.com

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**BRIEF HISTORY OF ACTIVITY RESTRICTION**

Old guidelines based on anecdote & assumptions:

- Don't lift more than 15lbs → NOT EVER or YOU could be the cause of your lymphedema.
- Protect your arm by avoiding activity on the at-risk arm → FOR THE REST OF YOUR LIFE.
- Be AFRAID of vigorous exercise because it may cause the onset of lymphedema.

NOT evidence based. Led to a culture of fear and inactivity for decades.

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**LYMPHEDEMA TYPES**

**Primary:** Lymphatic dysplasias

**Secondary:**
- Cancer treatments
- Malignant lymphedema
- Trauma
- Scarring
- Vascular disease

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**A CONSISTENT THEME**

Most lymphedema cases in the United States are caused by cancer or the treatment of cancer:

- Removal of lymph nodes
- Scarring and tissue adhesions
- Radiation therapy
- Weight gain
- The cancer itself

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**COMMON DIAGNOSES**

The most common cancers whose treatments cause lymphedema in the United States are:

- **Breast:** 0-94% incidence
- **Genitourinary:** (e.g. prostate, vulvar) 11% incidence in 8 studies, 1060 patients
- **Head and Neck:** (e.g. tongue, tonsil) 4% incidence in 3 studies, 139 patients
- **Melanomas:** 9% in 15 studies, 3676 patients
- **Sarcomas**

OPINION ALERT!

Post-surgical protective phase:
- Lasts for approximately 6 weeks
- Expect post-op edema
- This is NOT lymphedema!
- Return to prior level of function, within reason.

DO participate in post surgical ROM exercises.

Temporarily avoid activities that can overwhelm the affected region with inflammation for 6 weeks.
(bowling, contact sports, swimming with an open incision)

IMMEDIATE POST-SURGICAL GUIDELINES

Avoid inactivity; return to normal daily activities as quickly as possible after surgery. Continue normal daily activities and exercise as much as possible during and after non-surgical treatments.

-Schmitz, Courneya, Matthews 2010

Limit overhead reaching to 90 degrees for at least 7 days post-axillary node removal to reduce the risk of lymphedema & seroma formation.

-Todd et al 2008, Shamley 2005

No empirical evidence for lower extremity or head and neck guidelines.
**SEROMA PREVENTION**

- Shamley et al 2005
  - A review of 12 RCT’s from 2005 appears to indicate that delaying exercises for a week (status post-BrCA surgery) reduces the incidence of seroma.
- Todd, et al., 2008
  - 58 women limited shoulder AROM & exercise to 90 degrees for 7 days.
  - 58 women were unlimited for AROM and exercise after 48 hours.

**TODD ET AL. 2008**

- Direct volumetry was used with lymphedema definition of 200mL difference from pre-op to 1 yr of involved arm.
- There were significantly more women with lymphedema from the early mobilization group vs. in the delayed mobilization group. (16 vs. 6)
- Relative risk of developing lymphedema in the early mobilization group was 2.7.
- There were no statistically-significant differences in shoulder movement, grip strength, or self-evaluated outcomes between the two groups at 1 year.

**PROPOSED MECHANISM**

- The stumps of the afferent or efferent collectors of a removed node connect as the result of proliferation of the endothelium at the terminal portion of the damaged vessel.
- Regeneration of superficial vessels in dogs takes 4 days; deep vessels regenerate in 8 days.
- It is proposed that early mobilization of the shoulder complex interrupts regeneration of lymphatics and increases fluid accumulation in the affected region.

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**ACTIVITY RESTRICTION IMMEDIATELY TO 2 YEARS POST-OP**

Sagen A, Karesen R & Risberg MA. 2009

Study Design: Randomized Controlled

N=204 women in Norway with early-stage BrCA undergoing mastectomy or lumpectomy, all with ALND with or w/o XRT, chemo or hormone tx. Evaluated the development of arm lymphedema (ALE) in two groups.

- NAR = No activity restriction group
- AR = Activity restriction group

Study pain and sensation of heaviness with VAS

For determination of incidence of lymphedema, a 10% increase in volume was used.

Assessed pre-op, 3 mo, 6 mo and 2 yrs post-op.

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**NAR GROUP**

- Supervised PT program at outpatient clinic with moderate, progressive resistance ex. 2-3x/week.
- Total ex. time was 45 min with min. of 15 reps using 0.5kg (1.1lbs) for the first 2 weeks.
- Increased resistance over time, always with 15 reps per set **without upper limit.**

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**AR GROUP**

- Told to restrict activity of the affected limb for 6 months.
- Avoided heavy or strenuous physical activities including aerobic or other ex. classes that included heavy upper-limb work.
- Avoided carrying or lifting groceries or other items > 3kg (6.6 lbs).

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**RESULTS**

- Arm volume **did not differ significantly** between the groups at 3 or 6 months or at 2 years.
- Within each group, arm volume and ALE did increase significantly with time.
- Proportion of pts with ALE increased from 5% in the NAR group and 7% in the AR group to 13% at 2 years in both groups.
The American Cancer Society estimates that 480,000 adults are diagnosed annually with cancers for which treatments include irradiation and/or removal of lymph nodes from the groin or lower torso. These treatments may lead to lower-limb lymphedema. (eg, melanomas or gynecologic or genitourinary cancers).

Across multiple cancer diagnoses with distinct etiologies, those with LLL secondary to lymph-node removal or damage progress over time to an alteration in the ability to:

- walk at a functional pace for functional distances.
- lift heavy objects or stand for long periods.

In the absence of empirically-tested interventions to guide them, cancer survivors who experience LLL limit their mobility, sometimes retire early, quit work, and/or limit their social lives. Most studies about cancer/lymphedema and exercise are focused on the BrCA population. Future studies...

Very little, if any evidence is available. Control body weight. Avoid obesity. Avoid contact sports or use protective padding during sports that may cause bruising/hematomas. (karate, soccer, football) Follow upper-extremity guidelines until further data is available.
**HEAD & NECK, GENITAL, AND BREAST LYMPHEDEMA (OPINION ALERT!)**

There are no guidelines for activity or exercise in the literature. Onset/exacerbations do not appear to be as related to activity and/or exercise as for upper or lower-limb lymphedema.

**MAY BE AGGRAVATED BY:**
- Vasodilation
- Bouncing
- Increased filtration during high-intensity aerobic exercise (running, step aerobics)
- Inverted positions (headstands and downward dog during yoga practice)

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**HEAD & NECK, GENITAL, & BREAST LYMPHEDEMA**

Ensure adequate elastic support during exercise:

**Breast**
- Sports bra
- Body shaper tank top
- Foam pieces

**Genital**
- Compression shorts and/or genital support

**Head and Neck**
- Consider aquatics
- Facial compression

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**ACTIVITY RESTRICTIONS WITH LYMPHEDEMA**

Wear bandaging or garments during activities that increase heart rate or blood flow to the affected region for extended times IF the:

- swollen region becomes larger or there are increased symptoms of “fullness” or “heaviness” during or after the activity.
- swollen region becomes firmer during or after the activity.

E.g., washing windows, gathering leaves, gardening, raking/shoveling, etc.

**DO NOT** avoid trying new activities!

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**ENCOURAGE YOUR PATIENTS TO STAY ACTIVE!**

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Leading a sedentary lifestyle was associated with an increased risk of BCRL. Kwan 2010
OLD EXERCISE GUIDELINES

- Avoid use of the at-risk or swollen limb.
- NEVER lift more than (insert arbitrary number here) ____ lbs.

You will encounter physicians and patients who STILL believe that lifting a certain amount of weight will cause or exacerbate lymphedema. Based on FEAR and OPINION, not research and evidence.

A GOOD PROBLEM TO HAVE

Improved prognosis on the basis of earlier detection and newer cancer treatments has created a welcomed new challenge of addressing the unique needs of cancer survivors which include the sequelae of the disease, its treatment, and conditions predating diagnosis.

-Schmitz, Courneya 2010

Exercise can mitigate many of these sequelae BUT many people are still afraid to exercise based on old ideas and concepts.

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COURNEYA 2007


242 BrCA patients randomized into
  - Usual care: n=82
  - Supervised aerobic exercise: n=78
  - Supervised resistance exercise: n=82

For the duration of their chemotherapy.
STUDY PARAMETERS

Participants exercised beginning 1–2 weeks after initiating chemotherapy until 3 weeks post-final completion.

5 minute warm-up and cool down of light aerobic activity and stretching.

AET GROUP

- 3x/week on a bike, treadmill, or elliptical beginning at 60% of VO2 max for weeks 1–6.
- Progressed to 70% during weeks 7–12; 80% beyond week 12.

RET GROUP

- 3x/week completing 2 sets of 8–12 reps
- 9 different exercises (leg extension, leg curls, leg press, calf raises, chest press, seated row, triceps extension, biceps curls, and modified curl-ups.
- 60-70% of estimated 1 rep. max
- Resistance increased by 10% when > 12 reps

ASSESSMENT

Assessed at baseline, midpoint of chemo, 3–4 weeks post chemo, and 6 months follow-up.

Lymphedema assessed using standard volumetric arm measurements based on water displacement.

No information regarding number of lymph nodes removed or if radiation therapy completed.
FINDINGS REGARDING LYMPHEDEMA ONSET

Change of lymphedema considered to be significant if ≥ 200mL.

- Control group: 7.3% (6 of 82 participants)
- RET group: 3.7% (3 of 82 participants)
- AET group: 9.0% (7 of 78 participants)

WEIGHT LIFTING FOR WOMEN AT RISK FOR BCRL

Schmitz KH, Ahmed RL & Troxel A 2010

- N= 134 women at risk for BCRL completed study at 1 year follow up.
- Study Design: Randomized Controlled
- 1-5 yrs post unilat BrCA with at least 2 nodes removed without BCRL.
- Limb volume measured by direct volumetry.
- Lymphedema defined as 10% volume or circumference difference between arms or pitting edema or obscuration of anatomical architecture or documentation of previous documentation and treatment by CLT.

STUDY PARAMETERS

First 13 weeks:
- Participants were instructed in small groups 2x/week for 90-minute sessions.
- Led by certified fitness professionals at YMCA's.
- Stretching, cardiovascular warm-ups, ab and back exs, and weight lifting.
- Upper body exs:
  - Seated row, chest press, lat/front raises, biceps curls, triceps pushdown.
  - Began with little to no weight and progressed w/o limit.

EXERCISE ROUTINES

Initial 5 weeks:
- 2 sets of 10 reps
- Increased to 3 sets of 10
- Resistance increased by lowest increment after 2 sessions at a given weight w/o symptoms

At 13 weeks:
- Continued at 2x/week unsupervised for additional 39 weeks
FINDINGS

- BCRL in 11% of intervention group
- BCRL in 17% of no-exercise group
  In those with > 5 nodes removed
- BCRL in 7% of intervention group
- BCRL in 22% of no exercise group

Conclusion: Weight training in a supervised environment may serve a **PROTECTIVE** role in the development of BCRL.

EXERCISE AND LYPHEDEMA RISK

“...there have been eight randomized controlled trials that have all shown that upper body exercise (aerobic and/or resistance training) does **NOT** contribute to the onset or worsening of lymphedema among survivors at risk. (Schmitz 2011)

The only variable that was shown to predict onset of lymphedema was a baseline BMI > 25 kg/m², with an odds ration of **3.42** for lymphedema onset when compared to women who had a BMI < 25 at baseline.” (Sagen)

REGARDING LYPHEDEMA RISK

“Clinicians who treat breast cancer survivors can feel comfortable with advising their patients to **stay physically active during and after active treatment**, given ample empirical evidence from dozens of randomized trials of the safety of a variety of modes and intensities of exercise programming.”

-Yoga & Pilates

-Schmitz 2011
**Benfits of Exercise**
The specific benefits of physical-activity programming among breast cancer survivors include:

- **Improved fitness, quality of life and body weight or body composition.** Schmitz 2011
- **Reduced accelerated bone loss.** Ewertz 2011

**Be Aware**
*Accelerated bone loss* can occur in patients with premature or early menopause caused by chemotherapy, and among post-menopausal women receiving aromatase inhibitors to reduce exposure to estrogen.

- Arimidex
- Aromasin
- Femara

Ewertz 2011

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TREATMENT-INDUCED OSTEOPOROSIS

Breast cancer survivors (receiving post-op chemotherapy) are almost five times more likely to experience a vertebral fracture a year following treatment than their healthy counterparts...especially if they are premenopausal.

- Schwartz et al. 2007

DO encourage weight-bearing exercise.

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WEIGHT TRAINING FOR WOMEN WITH STABLE ARM LYMPHEDEMA

Schmitz KH, Ahmed RL & Troxel A 2009

- Study Design: Randomized Controlled
- Same design as for women at risk in the previous study discussed.
- N=141 breast cancer survivors with stable lymphedema of the arm. (130 for final statistics)
- Stable lymphedema defined as absence of therapist-delivered tx, no more than 1x need for antibiotics for infection, change in ADL ability or verified change in swelling of > 10% for 3 months.
STUDY PARAMETERS

- Lymphedema exacerbations ascertained and tx by CLT.
- Exacerbation defined as increased volume of 5% or more or tissue changes for > 1 week or longer.
- No upper-body exercise during exacerbation.
- Exercise resumed at lowest weight possible.

Participants given custom-fitted Jobst compression garments at baseline and 6 months.
- Required to wear the garments during weight lifting.
- Circumference and water volume monitored monthly.
- All participants required to attend a 1-hour educational lecture reviewing the NLN guidelines for risk reduction, treatment, and exercise.

FINDINGS

- No significant difference between the two groups in the proportion of women who had a change in limb swelling of 5% or more.
- Weight lifting reduced the number and severity of arm and hand symptoms.
- 19 of 23 in control group and 9 of 20 in the exercise group were found to have an exacerbation. (83% vs. 45%)
- Total number of tx sessions for exacerbation was 195 in control group and 77 in weightlifting group.

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REMEMBER THESE?
Post-surgical protective phase:
• Lasts for approximately 6 weeks.
• Expect post-op edema.
• This is NOT lymphedema!
• Return to prior level of function, within reason.

DO participate in post surgical ROM exercises.
Temporarily avoid activities that can overwhelm the affected region with inflammation for 6 wks.
(bowling, contact sports, swimming with an open incision)

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GUIDELINES RADIATION THERAPY EXERCISE
• Expect tissue inflammation within 2–3 weeks.
• Assess the radiation field.
• Avoid overstretching radiated skin.
• Avoid swimming.
• Avoid strength training of musculature within the radiation field.

GUIDELINES RADIATION THERAPY EXERCISE
• Compression may not be possible.
• Garments may irritate sensitive skin.
• Excessive sweating may further compromise irritated tissues or facilitate fungal infections.
**DO THE BENEFITS OF EXERCISE OUTWEIGH THE RISKS?**

Patients undergoing chemotherapy:
- can gain strength.
- can safely participate in cardiovascular training.
- can safely participate in strength training without increasing the risk of lymphedema.

Completion rates of chemotherapy were HIGHER in the groups exercising than not!

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**CARDIOVASCULAR DISEASE ISSUES**

Independent of treatment, **three-quarters** of breast cancer survivors had a risk of CVD at 10 years that **was the same or greater than their risk of having a recurrence of breast cancer.**

- Schmitz et al 2012

The leading cause of death in men with prostate cancer is cardiovascular disease, for which the **protective effects of exercise are clear.**

- Schmitz, Courneya 2010

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**BMI & LYMPHEDEMA**

- Prospective study of 997 female BrCA survivors.
- Being **obese** at breast cancer diagnosis was suggestive of an **elevated risk of lymphedema.**
  - (Kwan et al. 2010)
- Increased risk of lymphedema with BMI > 25 (Sagen 2009) and > 26 at 3 years post-op (Shaw et al. 2007)
**BMI FORMULA**

\[ \text{BMI} = \frac{\text{weight (lb) \times 703}}{\text{height}^2 \text{ (in\(^2\)}} \]

- Healthy = 20 – 25
- Possibly underweight = below 20
- Possibly overweight = above 20
- Obese = 30 or greater.

www.bmi-calculator.net/

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**BMI AND SURVIVAL**

- It has been identified that increased BMI is associated with a higher risk of breast cancer and poorer outcome, including breast cancer recurrence, second primary cancers, and higher morbidity and mortality. (Mahaneerat 2008)
- Weight gain after breast cancer diagnosis is a common adverse effect of treatment.
- Being overweight at the time of breast cancer diagnosis and weight gain after diagnosis are linked to poorer survival in many studies. (Holmes et al. 2005)

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**WEIGHT CHANGES AND LYMPHEDEMA**

In a study of 120 patients with BCRL, it was demonstrated that weight gain was the only significant, independent negative factor that influenced response to elastic compression. There also was a significant correlation between weight loss and reduction in arm volume. -Shaw et al 2011

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**BMI AND LE LYMPHEDEMA**

Report on 15 obese patients with bilateral, lower-extremity enlargement.

- 5 pts had abnormal results on lymphoscintigraphy that showed impaired lymphatic function consistent with lymphedema.
- All patients with a BMI above 59 had lymphedema, whereas each patient with a BMI less than 54 had normal lymphatic function. -Greene et al 2012
IRWIN ET AL. 2011

- Study of 4643, 50 to 79 yr-old postmenopausal women diagnosed with invasive breast cancer.
- Assessed pre-diagnosis and 3 or 6 yrs post.
- Assessed for all cause mortality & activity.

RESULTS

Women reporting vigorous-intensity physical activity after a breast cancer diagnosis:

- Brisk walking
- Swimming
- Biking

46% less risk of all-cause mortality even after adjusting for prognostic variables.

ENCOURAGE WALKING!

CONCLUSION

This finding suggests that adopting an active lifestyle after a cancer diagnosis can improve prognosis.
CANCER-RELATED FATIGUE

“Cancer-related fatigue has been defined as “an unusual, persistent, subjective sense of tiredness related to cancer or cancer treatment that interferes with usual functioning.” Schmitz 2011

INDIVIDUALIZING EXERCISE PROGRAMS

It is recognized that exercise programs may need to be adapted for the individual survivor on the basis of their health status, treatments received, and anticipated disease trajectory.

Exercise prescriptions should be individualized according to a cancer survivor’s pretreatment aerobic fitness, medical comorbidities, response to treatment, and the immediate or persistent negative effects of treatment that are experienced at any given time.


FATIGUE

- Fatigue constitutes a significant problem among 20-30% of patients 2 years after treatment. (Ewertz 2011)

- CRF is a common complaint from breast cancer pts during and after systemic therapies.

- There have been 9 RCT's that have examined the efficacy of exercise to mitigate fatigue during chemotherapy for BrCA. Five showed a significant positive effect. (Schmitz 2011)

MANAGING SIDE EFFECTS

Fitness professionals should understand the most common toxicities associated with cancer treatments:

- Increased risk for fractures
- Increased risk for cardiovascular events with hormonal therapies and chemotherapy.
- Treatment-related cardiotoxicity


Always be aware of your scope of practice!

See Guidelines at end of this presentation.
**TAKE HOME MESSAGES**

- Your patients at risk for and with lymphedema can safely exercise with an individualized program considering co-morbidities and/or cancer-related side and late effects.
- The benefits of exercise greatly outweigh the risks when the exercise is prescribed by a knowledgeable therapist.
- There is good evidence that “remedial” exercise is not the only safe option for this population.
EXERCISE ADDENDUM

Patient Guide to Full Spectrum of Remedial Upper-Extremity Exercises
(Individually Tailored to the Severity of Lymphedema in the Affected Extremity)


CORRECT POSTURE  Plant feet firmly on the ground, straighten spine and draw shoulders back.

ABDOMINAL BREATHING  Inhale through the nose, allow abdomen to protrude outward, and exhale slowly through the mouth.

SHOULDER ROTATIONS  Smoothly draw shoulders up toward ears, then pull them back, down and forward in a continuous circular motion.

HEAD TURNS  Slowly and smoothly turn head from center to left, back to center, and center to right and back. Do not use force; turn gently.

NECK STRETCHES  Slowly and smoothly draw chin toward chest, raise head, and look toward the ceiling. Repeat gently.

SHOULDER STRETCHES  Bend elbows and raise them parallel to the ground. Draw elbows back, squeezing shoulder blades together. Reverse motion to allow bent arms to cross in front of the chest. Repeat.

SHOULDER SHRUGS  Inhale through nose while raising shoulders toward ears. Follow by exhaling slowly through mouth while lowering shoulders.

ISOMETRIC CHEST PRESS  Clasp hands together in front of chest, raise bent arms parallel to the ground, and push palms together. Hold, release, and repeat.

FIST CLENCHES  Place hands on thighs, clench fists slowly, fully open fists, and spread fingers apart before clenching again.

WRIST CIRCLES  Begin with unaffected arm. Rotate fist in small circles, isolating movement to wrist only. Do the same with the affected arm.

TURNING ARM  Start with the unaffected arm. Raise in front, parallel to the ground. Rotate palm outward, then inward. Rest, then repeat on the affected side.

BREAST STROKE  Place palms together, then push hands forward, extending arms. Separate hands, drawing elbows back. Repeat as if swimming.
ELBOW CIRCLES: Bend arms at the elbow. Draw small circles with the point of elbows, progressing into larger circles. Reverse direction, spiraling down to small circles.

BREATHING: Pause and repeat previous breathing sequence.

REACH TO THE SKY: Lift arms overhead. Alternately reach up, then pull toward head.


ISOMETRIC CHEST PRESS: (Described previously.)

ISOMETRIC BICEP CURL: With hands clasped, simulate a bicep curling motion while resisting with the other hand. Switch sides and repeat. Do not hold breath. (There is no actual movement.)


FINGER DEXTERITY 1: With hands in a prayer position, push matching fingers from side-to-side several times. Move to the next pair until all five pairs are worked. Reverse order to the starting point.

FINGER DEXTERITY 2: With hands in a prayer position, separate matching pairs of fingers away from each other. Progress to the next pair until all five pairs are worked. Reverse sequence to the starting point.
SPECIFIC EXERCISE GUIDELINES


- Cancer and cancer treatments can potentially induce lean tissue degradation and abnormalities in the metabolic system in cardiac and skeletal muscle, resulting in loss of muscular strength in cancer survivors.

- Cancer survivors experience a decline in protein synthesis due to physical inactivity (de-conditioning) coupled with a possible reduction in the supply of amino acids in protein production.

- Ca survivors with reduced protein synthesis and muscle degradation experience muscle weakness, decreased functional work capacity, decreased flexibility, reduced mobility and diminished quality of life.

- This study focused on individualized mm strength/endurance training and aerobic conditioning with a 6-month ex intervention. 93% had surgery, 47% chemo, 67% radiation. Exercise trainers were certified cancer exercise specialists. Ex 2-3 days/week, 60 min, resistance training progressing from tubing, Cybex machines, dumbbells, aerobic training-treadmill/outdoor walking, stationary cycling, recumbent stepping.


- Pts performed 2-3 sets of each exercise with 8-12 reps per set. Resistance was based on heart rate response to the exercise and RPE. The ideal weight and number of repetitions elicited an RPE ranging from 1-5.

- Exercise intensity was based on HRR (Heart rate reserve) which is calculated as [(220-age)-RHR]x % ex intensity + RHR. RPE Borg Scale 0–10 where 10 = very, very hard and 0 = no exertion.

<table>
<thead>
<tr>
<th>Health and Fitness Status</th>
<th>Recommended Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary, poor health, low fitness</td>
<td>Start at 30-45% HRR; RPE 1-3, slow progression</td>
</tr>
<tr>
<td>Active, moderate health, average fitness</td>
<td>Start at 50-60% HRR; RPE 4-5, slow progression</td>
</tr>
</tbody>
</table>

Our findings suggest that moderate-intensity exercise can provide a sufficient physiological stimulus to improve muscular performance in cancer survivors, whether the exercise is performed during or after cancer treatment. Given that all tissues and systems in the human body are affected by physical exercise, and seeing that exercise in this study improved physical performance, it seems that regular exercise is a useful complementary strategy to improve the quality of life physically and psychologically for cancer survivors. Moderate-intensity, individualized prescriptive exercise is a safe and efficacious means to improve muscular function in cancer survivors.

Many of the primary benefits of exercise in healthy populations could, in essence, treat specific problems associated with cancer toxicities. (The study did note good improvements in depression and various categories of QOL-using the Beck Depression Inventory.)
INSTRUCTIONS FOR BORG RATING OF PERCEIVED EXERTION (RPE) SCALE

While doing physical activity, we want you to rate your perception of exertion. This feeling should reflect how heavy and strenuous the exercise feels to you, combining all sensations and feelings of physical stress, effort, and fatigue. Do not concern yourself with any one factor such as leg pain or shortness of breath, but try to focus on your total feeling of exertion.

Choose the number from below that best describes your level of exertion. This will give you a good idea of the intensity level of your activity, and you can use this information to speed up or slow down your movements to reach your desired range.

6 - No exertion at all
7
7.5 - Extremely light
8
9 - Very light. Corresponds to "very light" exercise. For a healthy person, it is like walking slowly at his or her own pace for some minutes.
10
11 - Light
12
13 - Somewhat hard, but still feels OK to continue.
14
15 - Hard (heavy)
16
17 - Very hard; very strenuous. A healthy person can still go on, but he or she really has to push himself or herself. It feels very heavy and the person is very tired.
18
19 - Extremely hard; extremely strenuous exercise level. For most people, this is the most strenuous exercise they have ever experienced.

RPE 10-POINT SCALE: RATING OF PERCEIVED EXERTION

0 - Nothing at all
0.5 – Very, very Light
1 - Light
2 - Fairly light
3 - Moderate
4 - Somewhat hard
5 - Hard
6
7 - Very hard
8
9
10 - Very, very hard (Maximal)
EXERCISE PRESCRIPTION


Objectives/Goals of Exercise Prescription:

1. To regain and improve physical function, aerobic capacity, strength and flexibility.
2. To improve body image and QOL.
3. To improve body composition.
4. To improve cardiorespiratory, endocrine, neurological, muscular, cognitive, and psychosocial outcomes.
5. Potentially, to reduce or delay recurrence or a second primary cancer.
6. To improve the ability to physically and psychologically withstand the ongoing anxiety regarding recurrence or a second primary cancer.
8. To improve the physiologic and psychological ability to withstand any current or future cancer treatments.

- The key US DHHS (Department of Health and Human Services) guideline for aerobic activity focused on an overall volume of weekly activity of 150 minutes of moderate-intensity exercise or 75 minutes of vigorous-intensity exercise or an equivalent combination.

- Guidance for strength training is to perform 2–3 weekly sessions that include exercises for major muscle groups. Flexibility guidelines are to stretch major muscle groups and tendons on days that other exercises are performed.

- However, it is recognized that exercise programs may need to be adapted for the individual survivor on the basis of their health status, treatments received, and anticipated disease trajectory.

★ Start with a supervised program of at least 16 sessions and very low resistance. Progress resistance at small increments. No upper limit on the amount of weight to which survivors can progress. Watch for arm/shoulder symptoms - including lymphedema - and reduce resistance or stop specific exercises according to symptom response. If a break is taken, back off the level of resistance by 2-weeks worth for every week of no exercise (e.g. for a 2-wk exercise vacation, back off to resistance used 4 weeks ago).

- Yoga seems safe as long as arm and shoulder morbidities are taken into consideration. Dragon boat racing is not empirically tested, but the volume of participants provides face-validity of safety for this activity. No evidence on organized sport or Pilates.
BONE DENSITY CHANGES

- The main detrimental effect on the skeleton by chemotherapy is mediated through loss of estrogen production induced by amenorrhoea in premenopausal women. The effects of chemotherapy in postmenopausal women are thus different from premenopausal women.

- In postmenopausal women, Tamoxifen has been shown to increase bone mass.

- Aromatase inhibitors suppress plasma estrogen levels by inhibiting or inactivating aromatase which is an enzyme that is responsible for the synthesis of estrogen from androstendion and testosterone.

- Breast cancer patients treated with either chemotherapy, tamoxifen (premenopausal women) or aromatase inhibitors are also at high risk of developing osteoporosis...These patients should be considered at high risk of osteoporosis regardless of age...

- Breast cancer patients who develop chemotherapy-induced osteoporosis undergo accelerated and highly significant bone loss, most prominently in the spine. This bone loss is more pronounced than the bone loss at normal menopause.

- A daily intake of 1000–1500 mg of calcium and 800–1000 IU of vitamin D is generally recommended for bone health. The supplement should be taken with a meal 2–3x a day.

- Biophosphonates are well-known potent antiresorptive agents. They work by inhibiting osteoclastic bone resorption, thereby preserving bone tissue and increasing bone mass, thus reducing fracture risk.

WEIGHT LOSS

The ACSM position on appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults includes:

- Activity of < 150 min/week is insufficient to reduce weight.
- 150–250 min/week of mod intensity aerobic activity results in 2–3 kg of weight loss.
- Exercise of 225–420 min/week results in a 5–7 kg weight loss.
- The need to decrease body fat varies by cancer site...Survivors with esophageal, head and neck, or gastric cancers may be underweight at the time of diagnosis and may lose more weight as a result of treatment, whereas many early-stage breast and prostate cancer survivors are overweight or obese at the time of diagnosis and may increase weight (and body fat) during treatment. The goal to improve body composition through fat loss is directed at survivors who are overweight or obese.
CARDIOPULMONARY ISSUES


- In the Framingham Heart study, the overall lifetime risk for CVD (Cardiovascular Disease) approached 40% for women at age 50 years...Population prevalence estimates for common CVD risk factors suggest that a significant proportion of women will have one or more cardiac risk factors at the time of breast cancer diagnosis.

- Independent of treatment, three-quarters of these breast cancer survivors had a risk of CVD at 10 years that was the same or greater than their risk of having a recurrence of breast cancer.

- Any pre-existing cardiovascular risk or diagnoses may be compounded by systemic adjuvant therapies (chemotherapy after surgery) with the potential for cardiac toxicity. Furthermore, the direct effects of adjuvant therapy on cardiac outcomes may be compounded by the indirect effects of therapy on changes in lifestyle behavior (reduced activity), a phenomenon that Jones and colleagues have termed “the multiple-hit hypothesis” for the observation of increased cardiovascular events among cancer survivors.

- The most common manifestation of anthracycline-induced (adriamycin) cardiotoxicity is left ventricular dysfunction that may be systolic or diastolic, asymptomatic or symptomatic. It is irreversible.

- Trastuzumab (Herceptin)...is associated with non-dose related cardiac dysfunction that ranges from asymptomatic decreases in left ventricular ejection fraction to symptomatic heart failure.

- Compared to anthracyclines that irreversibly damage myocardial structures...Trastuzumab-related cardiac dysfunction is almost always reversible and generally responds to standard heart failure treatment.

- Adverse effects of radiation therapy (RT) on the heart have been observed in long-term survivors of breast cancer, with a latency of approximately 10 to 20 years.

- The risk of death due to heart disease was 27% higher in women treated with RT compared with unirradiated controls.

- As with non-cancer survivors, long-term cardiovascular outcomes in breast cancer survivors may be improved by reduction of modifiable risk factors (e.g. weight control, exercise, smoking cessation, and treatment of hypertension and hyperlipidemia) and by early detection and treatment of CVD that develops despite risk-reduction efforts.
REFERENCES


