Overview and Facts:

**Definition:** Lymphedema is an abnormal accumulation of lymphatic fluid in the tissues that causes swelling. It can occur in the arm, trunk, abdomen or breast following breast cancer treatment. Lymphedema is the result of damaged or blocked lymphatic vessels caused by surgery, radiation therapy, injury, limb paralysis, infection, or an inflammatory condition. Surgery combined with radiation therapy for breast cancer is the most common cause of arm lymphedema for women in the United States.

**The Lymph System:** The lymph system is a one-way drainage route designed to rid the tissues of unwanted material and excess fluid. The lymphatic system plays a large role in immune function and circulation. It consists of **lymph vessels** located just under the skin. Everywhere where you have a blood vessel you have a lymph vessel, from the top of your head to the tips of your toes. The lymph fluid is "pushed" through the lymph system by the compression of surrounding muscles.
The lymph vessels empty into **lymph nodes**. The lymph nodes are found along the lymph vessel, they look like a string of pearls. There are approximately 600-700 lymph nodes throughout the body. The lymph nodes are gathered in clusters in your armpit, groin and neck. As the lymph vessels move fluid out of the tissues, waste products, bacteria, dead cells and large protein molecules are collected. The waste products are carried to the lymph nodes and broken down and eliminated, while the protein rich fluid is transported back to the heart where it rejoins the circulation.

Surgery or radiation can decrease the number of functioning lymph nodes and lymph vessels. When the lymph vessels are unable to transport sufficient lymph fluid back into circulation, it accumulates, resulting in swelling and thickening of the skin. This build up of protein rich fluid is called lymphedema.

![Lymphedema Diagram]

A – Pectoral Muscle  
B, C, D - Axillary Lymph Nodes  
E – Supraclavicular Lymph Nodes  
F – Parasternal Lymph Nodes

**Lymphedema due to Breast Cancer:**
Lymphedema can develop when lymphatic vessels or nodes are removed or damaged. Your risk of lymphedema has been shown to be dependent on several factors:

- **Extent of axillary node dissection**
- **Radiation Therapy**
- **Increased body weight at time of surgery or weight gain following treatment**
- **Infection in your arm**

Having these risk factors does not mean that you will get lymphedema. Differences in lymphatic anatomy and extent of surgical and radiation treatment will help explain why signs and symptoms may develop immediately following surgery or take months or years to appear, or not appear at all.

**Node Dissection:** The literature reports that the incidence of lymphedema following breast surgery varies between 6% and 30% for women who have had an axillary node dissection AND radiation. Improvements in surgical and radiation therapy techniques have reduced the prevalence to around 20%. Sentinel node biopsy decreases the risk of lymphedema to between 5% and 13% in women who have negative results, because a full axillary node dissection is avoided.

**Radiation therapy:** Radiation therapy improves survival for women with breast cancer. However, radiation therapy causes fibrosis which decreases the filtering capacity of the lymph system. Radiation therapy delays normal growth of lymphatics into tissues repairing after surgery and inhibits normal lymphatic proliferative response to inflammation.

In a study by Petrek (2001) 77% of patients who developed lymphedema got it within 3 years of surgery and radiation. Occasionally a factor such as an infection or cut may lead to swelling, but in many cases **THERE IS NO OBVIOUS CAUSE** – the literature suggests a gradual failure of existing lymph vessels. Women often want to blame themselves, or find what they did wrong to cause the lymphedema- you did not do anything to cause the lymphedema just as you did not do anything to cause your cancer. Removal of lymph nodes means the remaining nodes have to work harder and they may eventually be unable to keep up with demand.

The Petrek study examined 15 factors which were thought to contribute to lymphedema. Of the 15 factors analyzed only 2 were statistically significant: Weight gain and infection/injury. Shaw (2007) found that weight loss is helpful in reducing breast cancer related lymphedema.

**Increased Body Mass Index:** Increased BMI increases the incidence of lymphedema. Weight loss, whether through reduced calorie intake or increased exercise is helpful in the treatment of breast-cancer related lymphedema.
Risk of lymphedema may be decreased with some simple precautionary measures, but once women have risk factors, it may develop through no fault of the woman. There are many myths and “old wives tales” about how women can prevent/cause lymphedema.

“Many of the patient education materials in current use continue to promulgate behaviors and modifications, emanating from an unsubstantiated, empirically derived conception of the physical forces that govern the progression of lymphedema.” (Rockson, 1998)

The “Do’s and Don’ts” list found in many publications and on numerous web sites was originally written in 1966. Surgery, chemotherapy, and radiation therapy have changed substantially in 40 years and new research has proven many of the old rules invalid.

TurningPoint Women’s Healthcare emphasizes evidence in the scientific literature to support all of our therapies. There is NO EVIDENCE in the medical literature that lifting more than 5 pounds increases your risk of lymphedema, nor evidence that strenuous exercise can cause lymphedema. There is evidence that an increased body weight at the time of surgery or weight gain following surgery increases the chance of lymphedema and of recurrence of breast cancer. Therefore, it is important to exercise regularly and to avoid weight gain, or lose weight.

**MYTHS:**

1. Blood pressure readings or venipuncture cause lymphedema

**FACT:** There are no published studies or documentation that substantiate that either blood pressure readings or drawing of blood produces arm lymphedema.

2. Lifting anything heavier than 5 pounds causes lymphedema

**FACT:** Several studies have shown that resistance exercise—using bands, dumbbells or resistance equipment does not cause lymphedema. (Lane 2005, McKenzie 2003)

3. Exercise or repetitive motions cause lymphedema

**FACT:** Exercise encourages skeletal muscle contraction to help pump lymph fluid and promote lymph drainage. In a study by Mosely exercise actually decreased lymphedema. (Mosely 2007). Another study by Johansson found that women treated for breast cancer with axillary node dissection with or without adjuvant radiotherapy could maintain their level of physical activity and occupational workload after treatment without an added risk of developing arm lymphedema.
4. Air travel causes lymphedema

Air travel is thought to contribute to lymphedema due to the lowered cabin pressure exerting less atmospheric pressure on the limb. This combined with sitting in cramped seats decreases the muscle pump contributing to the obstruction of lymphatic drainage.

**FACT:** A survey done in 1996 in Australia found that lymphedema occurred in 27 of 490 individuals with breast cancer (5%). A closer examination of the data reveals that the flights were 8 hours or more in duration. Flying worsened the lymphedema symptoms in 23 patients. Since there was no control group (i.e. women who did not fly), it is difficult to firmly establish that the flight actually triggered the lymphedema, it should be noted that 95% of the women had no problems with arm lymphedema following air travel. (Casley-Smith 1996). Another study by Graham reported that in 287 breast cancer survivors that there were no cases of permanent new or permanent increased swelling after flying and nine cases of temporary swelling (Graham 2002) Interestingly, Graham found that the prophylactic wearing of a compression garment for women without lymphedema had increased swelling.

The relative risk for getting lymphedema with air travel is low. Each woman at risk for lymphedema must be evaluated individually. The therapist will consider the patient’s extent of treatment, axillary radiation or not, number of nodes removed, BMI, length of flight. Speak with your TurningPoint physical therapist if you are planning on taking a long airline flight. Your therapist will assist you with the options that are right for you.

**Signs and Symptoms of Lymphedema:**

How do I know if my arm swelling is lymphedema? Lymphedema always involves swelling that is greater in one arm than the other. Swelling may also occur in the trunk or breast.

**Common symptoms of arm lymphedema:**

- Feeling of tightness, fullness, tingling or heaviness
- Rings, watch or bracelets that become tight
- Arm may swell during the day and diminish to normal at night
- Decreased visibility of the veins on the back of the hand
- Greater roundness or fullness of the elbow, wrist or forearm
- Increased skin thickness
- Loss of wrinkles on the inside of the wrist.

The swelling may occur for the first time after a traumatic event (such as bruises, cuts, sunburn, and injuries), after an infection in the part of the body that was treated for cancer. It may occur shortly after surgery or may not appear for many years after the breast surgery.
Common symptoms of breast or trunk lymphedema

- Noticeable fullness of the trunk, waist or thorax
- Difference in the waistband tightness of clothing between morning and night (Waistband is tighter at night)
- Vise-like pressure around the lower rib cage or thorax

Common symptoms of breast lymphedema after lumpectomy

- Feeling of fullness, tenderness, pain, heat in the breast tissue
- Vise-like pressure around the chest
- Bra feels tighter, more uncomfortable at the end of the day than in the morning.

How Is Lymphedema Diagnosed?

Lymphedema is diagnosed after a careful evaluation of your medical history, including past surgeries and treatments, an evaluation of current medications and symptoms, and a complete physical examination. The therapists at TurningPoint Women’s Healthcare will measure each of your arms and calculate the volume of each arm using a special computer program specifically formulated to calculate lymphedema. Although there are no specific criteria for diagnosing lymphedema, a patient with any of the symptoms listed above in combination with a volume difference of at least 3% and/or 150 ml is considered to have lymphedema. If you are found to have lymphedema, your therapist will make individual recommendations depending on your current lifestyle, symptoms and severity of the lymphedema. Treatment may include compression with special garments or bandages, exercises, manual lymph drainage and skin care.

What can I do to Reduce the Risk of Lymphedema?

Lymphedema can be prevented or controlled (if it develops) by following the recommendations below.

1. Exercise Regularly

Include stretching, strengthening and aerobic activity

- To improve cardiovascular fitness, you should perform aerobic activities including walking, swimming, low-impact aerobics and individually prescribed exercises for 20 to 30 minutes at least four times a week.
- Take time to include a five-minute warm-up, including stretching exercises, before any aerobic activity and include a five to 10-minute cool down after the activity.
Let the therapists at TurningPoint Women's Healthcare know if any exercise causes unexpected pain. If your arm or trunk on the side where you had surgery becomes tired during exercise, cool down, then rest.

When you exercise you should wear loose clothing, adequate support for your chest wall/breast surgery and good shoes.

2. **Maintain or obtain a Body Mass Index** (BMI) of less than 25

- Reduce foods high in salt and fat. Include at least two to four servings of fruits and three to five servings of vegetables in your daily meal plan.
- Watch portions and eat several smaller meals per day.
- Eat a variety of foods to get all the nutrients you need.
- Use the package label information to help you to make the selections low in fat and sugar.
- Eat foods high in fiber such as whole-grain breads, cereals, pasta, rice, fresh fruits and vegetables.
- Drink plenty of water – divide your body weight by 2- that is the number of ounces of water (not including tea, coffee, carbonated drinks) you need to drink per day.
- Maintain your ideal body weight. A registered dietitian is available at TurningPoint Women's Healthcare to assist you in calculating and achieving your ideal body mass index

3. **Avoid infections**

Use common sense: Wear gloves while doing housework or gardening or when using strong chemicals or detergents. Avoid cutting your cuticles when manicuring your nails. Maintain good hand hygiene. Protect your skin from scratches, sores, burns and other irritations that might lead to infection. Use electric razors to remove hair and replace the razor head frequently. Use insect repellents to prevent bug bites.

4. **Stay alert for signs of infection**

- Fever over 100 degrees F (38 degrees C).
- Sweats or chills.
- Skin rash.
- Pain, tenderness, redness or swelling.
- Wound or cut that won’t heal.
- Red, warm or draining sore.

5. **Inform your doctor of any symptoms**

Notify your doctor if you have redness, swelling, a skin rash or blistering on the side of your body where you had surgery, or if you have a temperature over 100 degrees F
(38 degrees C). These warning signs of infection could be an early sign of lymphedema and should be treated immediately.

6. Air Travel

Air Pressure is caused by the weight of the air pressing down on the earth, the body and objects around us. The pressure value is dependent upon the amount of air above the point where the pressure is measured. Therefore, pressure is less with height. That is why the air is less heavy in Denver, the ‘mile-high city’, than in Atlanta. Generally, the air pressure drops about 1 inch of mercury for each 2,000-foot increase in altitude. At sea level the pressure of the atmosphere is 14.7 pounds per square inch. At 8,000 feet the pressure is around 11 pounds per square inch.

Airplanes fly at around 30,000 feet. At this altitude we could not survive without the addition of cabin pressure. Airlines pressurize the cabins, but not to the same degree as the pressure on the ground. The cabins are pressurized to the equivalent of 8,000 feet or around 11 pounds per square inch. The difference between sea level and a pressurized cabin, then, is 3 pounds per square inch, the question is whether a loss of 3 pounds per square inch is significant enough to trigger the onset of lymphedema on women at risk, or worsen the symptoms of existing lymphedema.

It is suggested that women who are at risk for lymphedema should take reasonable caution to avoid triggers that may cause swelling of the upper extremity. In the case of air travel many people report that their ankles and feet swell on long journeys - this is not lymphedema, but rather regular edema and is caused by inactivity - sitting for prolonged periods of time in cramped spaces and not using the leg muscles, as well as the decrease in pressure. This normal swelling may act as a trigger for lymphedema for women at risk.

Should I wear a sleeve and glove when I fly?

Women that have lymphedema are advised to wear their usual sleeve and glove when flying. As discussed earlier, studies reveal that 95% of all women did not exhibit lymphedema when flying, and that wearing a prophylactic sleeve when no lymphedema is present may actually contribute to lymphedema. Therefore each woman must make an individual choice based on a group of risk factors associated with their own medical history and length of flight. The physical therapists at TurningPoint can assist you in making that decision.

Useful tips for Air Travel

Seek Advice: Contact TurningPoint if you have any questions regarding air travel. Avoid Strain and Sprains: Strained muscles can cause an inflammatory reaction, which may be a trigger for women at risk. Consider investing in a wheeled suitcase and make sure you have the strength and range of motion to lift it.
Nutrition: If your destination is hot or prone to mosquitoes carry sun block and insect repellent with you

Additional Advice:

- If possible call ahead to the airline and request an exit seat, which gives you more legroom and freedom to move. Request an aisle seat so you can get up and move about frequently.
- Wear loose comfortable clothing
- There is no evidence that carrying your suitcase or lifting it into and out of the overhead bin will cause any lymphedema risk. However, lighter bags and wheeled suitcases reduce the risk of sprains and strains.
- Drink plenty of water or fruit juice on the flight. Humidity on the flights is generally around 20%- a lot less than summer time in Georgia where the humidity hovers in the 70"s. Therefore the air ion the plane is dry and can cause dehydration. Elevate your arms as often as possible and do some pumping exercises of the wrist and elbows to keep the circulation moving.

How is lymphedema treated?

1. Manual Lymphatic Drainage
   A Cochrane review of 195 scientific papers found Manual Lymphatic Drainage provided no benefit at any point over use of the sleeve or bandages alone. There are limited positive applications for Manual Lymphatic Drainage in cases of mild lymphedema or fibrosis.

2. Compression Garments
   The increased pressure exerted against the skin and tissues protect the vessels from stretching. Bertelli reported statistically significant reduction in edema in patients wearing garments. Superior reduction occurred in women without significant weight gain following treatment. (Bertelli 1992)

3. Compression Pump
   Guidelines for use and selection are unclear
   Some studies show pumps ineffective and dangerous, other studies show a statistically significant reduction in edema when used consistently in a 48 hour period. (Rinehart-Ayres 2007)

4. Arm Elevation
   There are no data on the efficacy of elevation in the treatment of lymphedema. Recommended guidelines are not published (Brennan 1998)

5. Exercise
   Data support the benefits of exercise in enhancing lymph flow as well as improving protein reabsorption
Summary

Studies are clear that women are at risk for lymphedema that have had axillary (arm pit) lymph nodes removed. The risk increases with increased numbers of nodes removed. Axillary radiation therapy and weight gain during or following treatment for breast cancer also increases our risk. With new surgical techniques such as sentinel node biopsy, extensive axillary node removal is avoided in many women, decreasing risk of lymphedema, the physical therapists at TurningPoint Women’s Healthcare will help determine your risk of lymphedema and develop a reasonable approach to the issue that allows you to continue to do the activities you love and maintain an active lifestyle.

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