

Clinical Question: In women who have undergone breast cancer surgery, including lymph node removal, do blood pressure measurements taken in the ipsilateral arm increase the risk of lymphedema?

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ABSTRACT

Throughout the healthcare industry fears of taking blood pressure in the arm of patients who have undergone breast cancer surgery have been propagated for decades and continue to be recommended by multiple medical societies and healthcare organizations. However, these precautions are not well based on evidence-based medicine and may have a more historical and traditional basis. The purpose of this study was to review current evidence-based research as well as current guidelines regarding ipsilateral arm blood pressure measurements in women who have undergone breast surgery for cancer including lymph node removal.

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Answer: No, evidence-based studies do not demonstrate an increased risk of lymphedema or arm swelling with blood pressure measurements taken on the ipsilateral arm after breast cancer surgery. Strict adherence to guidelines for the avoidance of ipsilateral arm blood pressure measurements after breast cancer surgery including lymph node removal may not be necessary.

Level of Evidence for the Answer: B

Search Terms: Lymphedema, Blood Pressure Measurement, Blood Pressure Cuff, sphygmomanometer, breast cancer, axillary lymph node dissection, sentinel lymph node biopsy

Date Search was Conducted: May 2016

Inclusion Criteria: Published systematic reviews, meta-analyses, cohort studies, and clinical research trials on the risk of lymphedema associated with the use of blood pressure measurements by cuff following breast cancer surgery.

Exclusion Criteria: Non-English language publications

SUMMARY OF THE ISSUES

The risk of lymphedema (LE) development associated with breast cancer treatment has been found to be increased by axillary surgery (sentinel lymph node biopsy [SNB] and axillary

lymph node dissection [ALND]) and by axillary lymph node irradiation.¹ These therapies are theorized to disrupt lymphatic vessel continuity leading to decreased lymphatic fluid outflow, interstitial lymphatic fluid accumulation, and resultant ipsilateral upper extremity swelling. The incidence of LE in women undergoing breast cancer surgery has been found to be 21% and may occur decades postoperatively.^{1,2} However, in those patients who develop LE, symptoms usually develop within 5 years of treatment.² More specifically with 75% developing within 2 years and 90% developing within 3 years of initial treatment.¹

Blood pressure (BP) measurement with a cuff on the ipsilateral arm has been posed as a risk factor for the development of LE after breast cancer therapy for years, regardless of the amount of lymph node excision. The original theoretical basis for this is thought to be from publications in the 1930's which hypothesized increased venous pressure as an underlying cause of LE.² The underlying mechanism has also been theoretically postulated as cuff pressure related damage to lymphatic vessels as well as pressure induced lymphatic fluid production.^{2,3} However, the majority of case reports and articles describing procedures in the at-risk arm as an underlying cause of LE formation or exacerbation accuse invasive procedures, such as needle sticks, which have a risk of infection and subsequent inflammation and not BP measurements.¹ Including BP measurements in the category of "medical procedures" to be strictly avoided in the ipsilateral arm may also cloud the issue as it is a less invasive procedure. Previous case-control and cohort studies have not been able to provide an association between BP measurements in the at-risk arm and an increased risk of LE.¹ Anecdotal, non-evidence based recommendations have been propagated throughout the medical community and can be seen in guidelines from major cancer and lymphedema societies [Table 2]. The National Cancer Institute, National Lymphoedema Network, and National Breast and Ovarian Cancer Centre all admit to the lack of scientific evidence regarding the use of BP cuffs after breast cancer surgery [Table 1], but maintain their stance to avoid BP cuff use in at-risk extremities [Table 2].

Studies have demonstrated a psychological burden and anxiety placed upon breast cancer survivors induced by the avoidance of this activity and the associated unscientifically founded fear of resultant lymphedema.¹ Arguments made against the avoidance of cuff BP measurement frequently refer to the use of compression garments and pneumatic pumps in the

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Table 1. International Statements on Evidence for Avoidance of Blood Pressure Measurements in At-Risk Arms after Breast Cancer Surgery

National Lymphoedema Network ⁴	"Studies have not determined the actual risk of having BP taken on the at-risk arm."
National Cancer Institute ⁵	"Generally anecdotal recommendations for taking preventive measures include..."
National Breast and Ovarian Cancer Centre ⁶	"It is currently unknown whether certain procedures such as ... blood pressure monitoring increase the risk of lymphedema."

Table 2. International Precautionary Recommendations for Prevention of Lymphedema after Breast Cancer Surgery

National Lymphoedema Network ⁴	"...if possible, use an uninvolved or not-at-risk extremity when taking blood pressure. In doctors' offices or hospitals, where machine BPs are regularly taken, the patient can request a hand BP measurement and have the medical provider only pump the cuff to just a little above the usual BP, thereby avoiding repetitive pumping or painful squeezing."
National Cancer Institute ⁵	"Avoid ... blood pressure monitoring in the affected arm, which could cause a tourniquet effect and obstruct lymph flow."
National Breast and Ovarian Cancer Centre ⁶	"... as a precaution, use the unaffected limb for these actions [blood pressure monitoring] whenever possible."
American Cancer Society ⁷	"Have your blood pressure taken on the unaffected arm, if possible. If both arms are affected, blood pressure can be taken on your thigh. Or, you can ask that blood pressure be measured by someone using a hand pump and stethoscope rather than using a machine; the machines often use high pressures for a longer time."

treatment of chronic LE as well as the frequent use of pneumatic tourniquets in at-risk arms by hand surgeons without resultant complications of LE.²

SUMMARY OF THE EVIDENCE

The Physical Activity and Lymphedema (PAL) trial was a prospective randomized controlled study published in 2009 evaluating the effect of progressive strength training on LE development or flare-ups in 295 breast cancer survivors (141 with stable LE and 154 at-risk for LE) who had undergone axillary surgery (at least one lymph node removed).⁸ Both patients with a history of stable LE and those at-risk for LE were included in the study. Showalter et al⁸ performed a sub-analysis of this study to examine the relationship between potential risk factor exposures and the development of at-risk arm swelling. Patient examination, measurements, and questionnaires were performed at baseline, 3, 6, and 12-month follow-up appointments. Water volumetry was used to compare inter-limb volume differences and diagnose incident arm swelling. BP measurement in an at-risk arm was one of 30 potential

risk-factor exposures patients were asked about in follow-up questionnaires.⁸ BP cuff monitoring in the at-risk arm was not significantly associated with incident arm swelling (odds ratio 1.47; 95% CI 0.18 – 11.77; P=0.72).⁸ This study concluded that the results could not support previous recommendations to avoid ipsilateral BP measurements after axillary surgery in breast cancer patients.⁸

Ferguson et al³ prospectively screened 632 women diagnosed with breast cancer between 2009-2014 for an association of risk-reducing precautionary behaviors, including ipsilateral arm BP measurement, with risk of LE in a large cohort study. All patients underwent lumpectomy or mastectomy, received either no axillary surgery, SNB, or ALND and were followed for 6-60 months (median 24 months postoperatively).³ Perometer measurements were used to examine changes in upper extremity volume preoperatively, postoperatively, and at follow-up appointments. Patient surveys, which included reported number of blood pressure measurements in the at-risk extremity, were obtained at each follow-up appointment. Analysis of the entire study population found BP measurements

taken in at-risk arms to not be associated with an increase in arm volume ($P=0.15$).³ Analysis of a subset of patients who had undergone ALND found no significant association between BP measurements taken in the at-risk arm and increases in ipsilateral arm volume ($P=0.39$).³ The authors concluded their evidence-based results bring into question and provide reasonable doubt to the burdensome guidelines that recommend avoidance of BP measurements in at-risk upper extremities after breast cancer surgery.

Risk factors for LE at 18-months postoperatively in 450 women who underwent breast cancer surgery with either SNB or ALND were examined in a multicenter prospective cohort study conducted between 2009-2013 by Kilbreath et al.⁹ SNB was defined as having <5 nodes removed and ALND was defined as having ≥ 5 nodes removed.⁹ Patients were assessed by examination and diaries preoperatively, within 4 weeks postoperatively, and at 6, 12, and 18 months postoperatively. Standardized bilateral limb circumference measurements were used to calculate limb volumes and bioimpedance spectroscopy was used to make a diagnosis of LE. Patients were asked to maintain weekly diaries recording events that occurred related to risk factors, including BP measurements in the at-risk arm, throughout the postoperative period, however only 243 (53%) complied at the 18-month follow-up.⁹ The number of lymph nodes removed was found to be a risk determining factor risk of LE development, with women undergoing ALND found to be at increased risk of LE (18.2%) compared to SNB (3.3%).⁹ Analysis including diary entries at 18-month follow-up found that in patients undergoing ALND, BP measurements in the at-risk arm did not reach clinical significance for risk of LE (odds ratio 1.3; 95% CI 0.5 – 3.6; $P=0.6$).⁹ The authors suggested that women should not be overly fearful of ipsilateral arm BP measurements and placed emphasis of early detection of LE best accomplished by attentiveness to changes in the at-risk arm.⁹

CONCLUSION

Historical guidelines for the avoidance of blood pressure measurement in the ipsilateral arm after breast cancer surgery including lymph node excision have been based on anecdotal, theoretical, and non-evidence based recommendations. Ipsilateral blood pressure measurements are frequently included in precautionary guidelines with other more invasive procedures, such as blood draws. While it is important for both the patient and healthcare practitioner to be vigilant of swelling in the post-operative at-risk upper extremity, evidence-based studies do not demonstrate an increased risk of arm swelling or lymphedema in association with blood pressure measurements taken on the ipsilateral arm. These studies indicate that *strict* guidelines for the avoidance of ipsilateral arm blood pressure measurements after breast cancer surgery including lymph node removal may not be

necessary. These *strict* guidelines may cause unnecessary burden on the patient and make obtaining blood pressure measurements overly burdensome in some patients.

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