

Original Research

Survey on Management of Unilateral Axillary Lymphadenopathy after Recent Ipsilateral COVID-19 Vaccination

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Abstract

Background: In the setting of widespread COVID-19 vaccination and booster administration, there is an increased incidence of axillary lymphadenopathy identified during breast imaging.

Purpose: To investigate how breast imaging radiologists manage unilateral axillary lymphadenopathy (UAL) after a recent ipsilateral COVID-19 vaccination.

Methods: A 26-question survey was distributed to 12 California breast imaging facilities in June 2022.

Results: There were 10 responses to the survey (83% response rate). All respondents considered recent ipsilateral COVID-19 vaccination relevant to the interpretation of UAL. Seven respondents (70%) also considered non-COVID-19 vaccinations relevant. All respondents documented recent COVID-19 vaccinations, but 4 (40%) had no information for other vaccines. Eight respondents (80%) delayed screening after COVID-19 vaccination during initial vaccination efforts, and 3 (30%) still required or suggested delaying screening at the time of the survey. Breast Imaging Reporting and Data System (BI-RADS) categorization for UAL with no abnormal findings in the ipsilateral breast varied by facility and modality. BI-RADS categorization for UAL previously assigned to BI-RADS 0 or associated with suspicious ipsilateral breast findings varied, but practices tended to demonstrate a high level of suspicion unless the UAL showed improvement on follow-up imaging. For unchanged UAL on initial follow-up, 7 (70%) assign BI-RADS 3, and 3 (30%) assign BI-RADS 4.

Conclusion: Despite available guidelines, there was no consensus approach to managing UAL after vaccination among academic and community-based breast imaging radiologists in California. Management was more uniform for a subset of patients perceived to be at higher risk for lymph node metastases, with most or all respondents recommending biopsy when there was a suspicious finding in the ipsilateral breast, concurrent ipsilateral breast cancer, or concurrent malignant tumors not in the breast known to metastasize to the axilla.

Introduction

Unilateral axillary lymphadenopathy (UAL) may be a presenting sign of ipsilateral breast cancer.¹⁻⁵ Less frequently, other cancers may cause UAL, including lung, gastrointestinal, pancreatic, thyroid, and ovarian cancers, as well as melanoma, lymphoma, and leukemia.⁶ Several systemic causes of bilateral axillary lymphadenopathy will occasionally appear unilaterally, including mononucleosis, tuberculosis, sarcoidosis, rheumatoid arthritis, and systemic lupus erythematosus.⁶ Silicone lymphadenopathy secondary to a ruptured breast implant may occur unilaterally,⁶ but the mammographic and sonographic appearances of the lymph nodes are often characteristic of the presence of silicone. Transient reactive UAL in response to locoregional infection or inflammation is also common.⁶ Deltoid vaccinations induce an immunologic response that may enlarge ipsilateral axillary lymph nodes. Given this variety of benign and malignant causes, UAL may pose a diagnostic dilemma.

Breast imaging performed shortly after vaccination requires thoughtful management if UAL is present. The possibility of an unnecessary workup of a benign, expected finding must be balanced against the risk of missing a malignant tumor, especially in patients at high risk for developing breast cancer.⁶ UAL in the setting of recent vaccination has become highly relevant since the start of COVID-19 vaccinations in early 2021. Widespread COVID-19 vaccination greatly increased the incidence of UAL in patients presenting for screening mammography. Retrospective radiology series⁷⁻⁹ report UAL incidence rates of up to 44% in women who underwent breast imaging after vaccination, much higher than the 1.1% observed clinically in adults during vaccine trials, a difference that is attributed to the increased sensitivity of imaging compared to physical examination.¹⁰ Similarly, the incidence of imaging-detected lymphadenopathy reported in the same series⁷⁻⁹ is higher than the rates of reported axillary swelling or tenderness during vaccine trials (11.6% after the first dose and 16.0% after the second dose in adults aged 18-64 years, 6.1% after the first dose and 8.4% after the second dose in adults 65 years and older).¹⁰

Key Points

- All respondents, inclusive of academic and community-based radiologists, considered recent ipsilateral COVID-19 vaccination relevant in interpreting UAL, while 70% also considered other vaccinations relevant.
- Common reasons for assigning BI-RADS 4 or 5 to UAL in the context of a recent vaccination include a suspicious finding in the ipsilateral breast, concurrent known ipsilateral breast cancer, a concurrent malignant tumor not in the breast that is known to metastasize to the axilla, or a personal history of breast cancer.
- For improved UAL on follow-up, 100% of the respondents assign BI-RADS 2. For stable UAL on follow-up, 70% assign BI-RADS 3, and 30% assign BI-RADS 4.

Abbreviations

BI-RADS: Breast Imaging Reporting and Data System

CBIIG: California Breast Imaging Information Group

MRI: magnetic resonance imaging

SBI: Society of Breast Imaging

UAL: unilateral axillary lymphadenopathy

Keywords

lymphadenopathy; vaccination; breast imaging; COVID-19

Imaging also indicates that the duration of UAL after vaccination is longer than suggested by clinical data from vaccine trials. Vaccine trials report the detection of UAL at 2-4 days post-vaccination and a median duration of 1-2 days,¹⁰ however a radiology series of 1217 patients⁷ noted that UAL was detected at 1-71 days after vaccination and persisted for up to 43 weeks. One study that relied on ultrasound examinations¹¹ reported that axillary lymphadenopathy resolved a mean of 127 days after the first vaccination. In another study,¹² 9 of 11 (82%) lymph nodes with cortical thickening could be identified 24-28 weeks after the first vaccination, with 5 of 9 (56%) demonstrating persistent cortical thickening.

In winter of 2021, the Society of Breast Imaging (SBI) published guidelines¹³ for the management of UAL in the context of a recent COVID-19 vaccination. The guidelines recommended considering the postponement of screening mammography until 4-6 weeks after the second dose of a two-dose regimen (ie, after completion of the initial vaccination schedule). Documenting COVID-19 vaccination status, timing, and side (ie, left or right arm) on intake forms was recommended.

Breast Imaging Reporting and Data System (BI-RADS) 0 assessment was recommended for UAL seen on screening mammography. If BI-RADS 3 was assigned to UAL after a diagnostic workup, these guidelines suggested a follow-up interval of 4-12 weeks following the second dose of a two-dose vaccine regimen. If UAL persisted on follow-up imaging for instances assigned BI-RADS 3, these guidelines recommended a biopsy.

SBI released updated guidelines⁷ in February 2022 with significant changes (Table 1). SBI no longer recommends postponing screening mammography after COVID-19 vaccination, and the society recommends BI-RADS 2 for UAL ipsilateral to vaccination if there are no suspicious findings on screening mammography.

For cases assigned BI-RADS 3, the recommended follow-up interval was increased from 4-12 weeks to 12 or more weeks. Patient care after follow-up imaging is dependent on whether UAL remains unchanged, has improved, or has increased. For UAL that has remained unchanged on follow-up, SBI now recommends a second BI-RADS 3 assignment with follow-up 6 months after the initial presentation. If UAL has persisted but improved on follow-up imaging, SBI recommends the assignment of BI-RADS 2 or BI-RADS 3 with further evaluation at 6 months after the initial presentation. If UAL has increased on follow-up imaging, SBI recommends a biopsy.

Expert opinion and single institution experience¹⁴⁻²⁶ informed the SBI guidelines. Several studies have also presented data regarding modalities other than mammography, including ultrasound²⁷⁻²⁹ and magnetic resonance imaging (MRI).^{30,31} However, it is unclear how breast imaging radiologists manage UAL in the context of a recent vaccination in practice following their experience with COVID-19 vaccinations and after the release

of the 2022 updated SBI guidelines. In addition, the SBI guidelines⁷ are meant for asymptomatic, average-risk women with no breast cancer history and no previously diagnosed malignant tumor that might involve the axilla. It is unclear how the care of women with higher levels of risk should be managed. Therefore, we performed this survey to understand how breast imaging radiologists in California manage UAL in the context of a recent ipsilateral vaccination.

Materials and Methods

Survey Management

The study was certified as exempt from Institutional Review Board review. A waiver of signed consent was granted given the online, anonymous nature of the data collection.

A subset of the California Breast Imaging Information Group (CBIIG, previously the California Breast Density Information Group), a working group of breast imaging radiologists representing academic and community-based practices (Kaiser Permanente Walnut Creek Medical Center, Keck School of Medicine of the University of Southern California, Santa Clara Valley Medical Center, Stanford University School of Medicine, Sutter Health's Palo Alto Medical Foundation, UC Davis, UC Irvine, David Geffen School of Medicine at UCLA, UC San Diego, and UC San Francisco), developed the survey. The survey addressed four major themes related to UAL: relevance of recent vaccination history; delaying screening after vaccination; initial BI-RADS management of UAL on screening mammography, MRI, and ultrasound; and follow-up for UAL.

The working group iteratively developed the initial survey questions and field-tested a draft survey. The group changed the survey design, language, and organization based on feedback. The working group approved the final 26-item survey for distribution (see Supplemental Material).

Study Participants

We provided an electronic link to the anonymous voluntary survey (Qualtrics, Provo, UT) via email to CBIIG breast imaging facilities in California (N = 12) on June 6, 2022. We avoided multiple

responses from the same facility by emailing only a single contact at each facility (for CBIIG member institutions with multiple independent breast imaging facilities with completely separate operations and protocols, a separate contact was identified for each facility). We followed the survey invitation two weeks later with a single reminder email. The survey remained open for 30 days after the delivery of the first email. The response rate was 10 of 12 (83%).

Results

Practice Setting

Of the 10 respondents, 5 (50%) practiced in an academic health system, 2 (20%) in a county-affiliated public health system, 2 (20%) in a private practice, and 1 (10%) in an academic-private hybrid.

Recent Vaccination

All 10 respondents considered recent ipsilateral COVID-19 vaccination relevant to the interpretation of UAL. Seven respondents (70%) also considered other vaccines (eg, influenza) relevant to UAL interpretation. Responses varied regarding how long an ipsilateral vaccination might account for UAL. When asked specifically about COVID-19 vaccination, responses ranged from 6 weeks (3, 30%) to 12-16 weeks (1, 10%), with a median of 12 weeks (5, 50%). Of the 7 respondents who considered other vaccines relevant, responses about how long these vaccinations would affect the interpretation of UAL ranged from 4 weeks (2 of 7, 29%) to 12 weeks (2 of 7, 29%). Most respondents (6 of 7, 86%) stated that the length of time that they considered non-COVID-19 vaccinations relevant to interpretation had changed because of their experience with reactive lymphadenopathy from COVID-19 vaccinations (Table 2).

Most respondents (6 of 10, 60%) reported practice-wide guidelines for the management of UAL on breast imaging in the context of a recent vaccination. All practices reported documentation of COVID-19 vaccination, either via intake forms or technologist notes (9, 90%) or from the electronic medical record (1, 10%). However, 4

(40%) did not have this information for other vaccinations.

Delay of Screening

When COVID-19 vaccines started being widely administered in 2021, most responding practices (8, 80%) delayed or rescheduled screening mammography exams after a recent vaccination. The length of delay varied, ranging from 4-6 weeks (1 of 8, 13%) to 12 weeks (1 of 8, 13%) after vaccination. Two respondents (25%) answered that they would delay screening 6 weeks, 1 (13%) would delay screening 6-8 weeks, 1 (13%) would delay screening 8 weeks, and 1 (13%) would delay 8-12 weeks. One of the 8 respondents (13%) answered "I don't remember." After the publication in February 2022 of updated SBI guidelines that no longer recommend any delay in screening after vaccination,⁷ a minority of the respondents reported that their practices still required (2 of 10, 20%) or suggested (1 of 10, 10%) delaying screening for 4 to 8 weeks after vaccination.

Initial BI-RADS Assessment

The survey inquired about BI-RADS assessment of UAL on screening mammography, MRI, and ultrasound (Tables 3A and 3B). It also queried circumstances triggering a BI-RADS 4 or 5 assessment for UAL to explore risk stratification (Figure).

Mammogram

If a screening mammogram reveals isolated UAL in the context of a recent ipsilateral vaccination and no abnormal findings in the ipsilateral breast, 4 (40%) respondents assign BI-RADS 0 to the UAL, 3 (30%) assign BI-RADS 2, and 3 (30%) assign BI-RADS 3. For those respondents assigning BI-RADS 0, 1 of 4 (25%) delay recall of the lymph nodes (ie, additional evaluation is recommended but is delayed a certain number of weeks after vaccination). If a screening mammogram reveals UAL in the context of a recent ipsilateral vaccination with a finding assigned BI-RADS 0 in the ipsilateral breast, 7 (70%) respondents assign BI-RADS 0 to the UAL, while 3 (30%) assign BI-RADS 3.

Ultrasound

If ultrasound demonstrates isolated UAL in the context of a recent ipsilateral vaccination and the ipsilateral breast parenchyma is normal, 4 respondents (40%) assign BI-RADS 2 to the UAL, and 6 (60%) assign BI-RADS 3. If ultrasound demonstrates UAL in the context of a recent ipsilateral vaccination with an ipsilateral suspicious breast finding, all 10 respondents assign BI-RADS 4 to the UAL. Of note, 3 practices (30%) reported routinely imaging the axilla on all breast ultrasound studies, while the remainder (7, 70%) only image the axilla after a suspicious ipsilateral breast finding.

MRI

If breast MRI reveals isolated UAL in the context of a recent ipsilateral vaccination and the ipsilateral breast parenchyma is normal, 3 (30%) assign BI-RADS 0 to the UAL, 5 (50%) assign BI-RADS 2, and 2 (20%) assign BI-RADS 3. If MRI demonstrates UAL in the context of a recent ipsilateral vaccination with a suspicious finding in the ipsilateral breast, 8 (80%) assign BI-RADS 4 to the UAL, while 2 (20%) assign BI-RADS 0.

Circumstances triggering BI-RADS 4 or 5

Most or all respondents reported that they would typically consider assigning BI-RADS 4 or 5 to UAL in the context of a recent ipsilateral vaccination (Figure) if there were a suspicious finding in the ipsilateral breast (10, 100%), concurrent known ipsilateral breast cancer (10, 100%), or a concurrent non-breast malignant tumor known to metastasize to the axilla (9, 90%). Half of the respondents (5, 50%) would typically consider assigning BI-RADS 4 or 5 for UAL if the patient had a personal history of breast cancer. Other settings prompting a BI-RADS 4 or 5 assessment for UAL include concurrent known contralateral breast cancer (4, 40%), a suspicious finding in the contralateral breast (3, 30%), or a patient with a high risk of breast cancer (2, 20%).

Follow-up and Final Disposition

For those cases of UAL in the context of a recent vaccination that were designated as BI-RADS 3, the initial follow-up interval assigned by respondents ranged from 4 weeks (1, 10%) to 12 weeks (6, 60%), with 8 (80%) recommending

follow-up in either 8-12 weeks or 12 weeks. Eight (80%) recommend follow-up intervals based on the time elapsed since the initial imaging study rather than on the time since vaccination (2, 20%).

When the UAL that was initially assigned to BI-RADS category 3 has improved but is still present on follow-up imaging, all 10 respondents assign BI-RADS 2. When the UAL is unchanged on initial follow-up, 7 (70%) assign BI-RADS 3, and 3 (30%) assign BI-RADS 4 (Table 4).

Discussion

Recent ipsilateral vaccination is a top differential consideration for isolated UAL on breast imaging. In response to the challenge of greatly increased findings of UAL at screening mammography exams in the wake of widespread COVID-19 vaccination, the SBI created guidelines for UAL management following ipsilateral COVID-19 vaccination. These guidelines likely are the most influential to date regarding UAL and vaccination in the USA. However, the results of this survey demonstrate that UAL management following both COVID-19 and non-COVID-19 vaccinations remains heterogeneous.

All 10 respondents felt that recent COVID-19 vaccination was relevant to the interpretation of UAL in breast imaging, and most (7, 70%) also felt that all other vaccines were relevant. Despite this, there was no consensus on how long an ipsilateral vaccination remained relevant to the evaluation of UAL on breast imaging, a metric that the SBI guidelines state should be established by individual practices.⁷ Responses varied from 4 to 12 weeks for non-COVID-19 vaccinations and from 6 to 16 weeks for COVID-19 vaccinations. Of the 10 respondents, 7 (70%) had different definitions of "recent" for COVID-19 and non-COVID-19 vaccinations, as they believed that COVID-19 vaccines had a longer-lasting impact on UAL than other vaccines.

Although respondents treated COVID-19 and non-COVID-19 vaccinations differently, most (6 of 7, 86%) said they had changed their definition of "recent" for other vaccinations based on their experience with COVID-19 vaccination.

Regardless of the lack of consensus, practices may be underestimating the length of persistence of vaccine-related UAL, at least with respect to COVID-19 vaccinations. In a cohort of 111 patients undergoing periodic follow-up ultrasounds for UAL after COVID-19 vaccination, adenopathy endured for a mean [SD] of 127 [43] days after the first vaccine dose.¹¹

SBI guidelines recommend that COVID-19 vaccination status be collected on breast imaging intake forms. All 10 practices reported collecting this information for COVID-19 vaccinations, but 4 (40%) did not document other vaccinations despite most respondents (7, 70%) feeling other vaccines are also relevant. Despite its importance to the assessment of UAL, it is not clear how well this documentation practice will be maintained as the COVID-19 pandemic wanes.

The patient population presenting for breast cancer screening is expected to have a higher-than-average rate of compliance with other public health interventions, including influenza, pneumococcal, and zoster vaccinations. For example, women who present for screening are more likely to receive an influenza vaccine in the subsequent two years when compared to women who do not (odds ratio, 1.45).³² Therefore, vaccination data will remain relevant after the COVID-19 pandemic. Vaccination information can be difficult to find in the electronic medical record and may not include documentation from outside pharmacies or other facilities, so collection by the breast imaging facility may be the only option for a complete history.

During the initial widespread COVID-19 vaccinations in 2021, the SBI guidelines recommended that screening mammography exams be delayed for 4-6 weeks after the second vaccine dose. During this period, 80% (8 of 10) of respondent practices recommended delay of imaging. As of June 2022, several practices still required (2, 20%) or recommended (1, 10%) delay of screening in the context of a recent vaccination, ranging from 4 to 8 weeks after vaccination, despite the updated SBI guidelines recommending otherwise.

The SBI guidelines cite concerns regarding the deficit in breast cancer screening caused by the early pandemic, and the failure of screening utilization to normalize in the period since the

early pandemic, as the reasoning for no longer delaying screening.⁷ Individual practices likely weighed the risks and benefits when instituting these delays and may have mechanisms in place to mitigate further delays that might cause a patient to skip screening altogether. Such variability in practice may cause further confusion for referring providers and the general population, especially given the various differing screening guidelines already available.

The SBI guidelines released in 2021 recommended a BI-RADS 0 assessment for UAL identified on screening mammograms for women who had recently been vaccinated against COVID-19. The updated guidelines from 2022 state that an assessment of BI-RADS 2 may be considered if there are no suspicious mammographic findings. Despite these updated recommendations, multiple respondents reported assigning BI-RADS 3 (3, 30%), or recommending delayed BI-RADS 0 follow-up in an approach similar to that taken with the assignment of BI-RADS 3 (1, 10%), to UAL on screening mammograms.

Some patients who demonstrate UAL on screening mammograms after receiving a vaccination against COVID-19 also demonstrate findings assigned BI-RADS 0 in the parenchyma of the ipsilateral breast. In such cases, 30% (3 of 10) of respondents still designate the UAL as BI-RADS 3, which avoids immediate further imaging. This may reflect some of the challenges UAL posed during the COVID-19 pandemic. For example, the resulting delay of follow-up imaging in the context of BI-RADS 0 findings in the ipsilateral breast may inadvertently delay necessary care if those findings are later determined to be malignant.

UAL noted on ultrasound or MRI leads to additional imaging studies and biopsies. For ultrasound showing UAL without an ipsilateral suspicious finding, 6 respondents (60%) in our study recommend follow-up BI-RADS 3. If there is an ipsilateral suspicious finding, all respondents recommend a biopsy. Finally, for MRI showing UAL without any ipsilateral suspicious findings, half of the respondents recommend additional imaging with a classification either as BI-RADS 0 (3, 30%) or as BI-RADS 3 (2, 20%) assessments. If there is an ipsilateral suspicious finding, 8 respondents recommend a biopsy (80%), but 2 (20%) assign BI-RADS 0. Although this information was not

obtained by the survey, it is likely BI-RADS 0 and BI-RADS 3 lead to ultrasound evaluation or follow-up for UAL.

The SBI guidelines include recommendations for follow-up management after BI-RADS 3, but not all practices follow these guidelines. The initial SBI-recommended follow-up interval was 4-12 weeks, and increased to 12 or more weeks in the updated guidelines. However, 4 (40%) practices are using shorter than recommended initial follow-up intervals, meaning that there is a reasonable chance that vaccine-related UAL persists at the time of follow-up.⁷

For UAL persisting on follow-up examination, the SBI guidelines initially recommended further evaluation by tissue sampling. The revised guidelines now suggest the assignment of BI-RADS 2 for improved UAL, BI-RADS 3 with follow-up imaging 6 months after the initial presentation for unchanged UAL, and tissue sampling for worsening UAL. All 10 respondents agree that improved UAL should be given a BI-RADS 2 assessment. However, a sizable minority (3, 30%) would recommend BI-RADS 4 rather than further BI-RADS 3 imaging follow-up (7, 70%) for UAL that appears unchanged on the follow-up study.

When queried about circumstances that trigger the assignment of BI-RADS 4 or 5 to UAL, facilities demonstrated a high level of suspicion regarding UAL in certain settings, even in the context of a recent vaccination. All 10 respondents recommend a biopsy if there is a suspicious finding in the ipsilateral breast or concurrent known ipsilateral breast cancer, and 9 (90%) recommend a biopsy if the patient has a concurrent malignant tumor not in the breast that is known to metastasize to the axilla. Half of the respondents would consider assigning BI-RADS 4 or 5 for UAL based solely on a patient's history of breast cancer (no concurrent breast cancer). Patients with a personal history of breast cancer or other malignant tumor should therefore consider receiving vaccinations in the thigh or contralateral arm.^{14,21}

Including the small number of participants (10), there are limitations to this study. Although the survey was anonymous and voluntary, the respondents were all members of CBIIG and therefore contributed to the development of the survey. Academic practices are overrepresented in the study; however, the participants do span a

variety of the facility types that perform breast imaging. Finally, the results may not be generalizable to regions beyond California.

In conclusion, despite available guidelines, there was no consensus approach for the management of unilateral axillary lymphadenopathy after ipsilateral vaccination among breast imaging radiologists in California. Management was more uniform for a subset of patients perceived to have a higher risk for lymph node metastases, with most or all respondents recommending biopsy when there is a suspicious finding in the ipsilateral breast, concurrent ipsilateral breast cancer, or concurrent malignant tumor not in the breast that is known to metastasize to the axilla. Practices should consider adding risk stratification to their management protocols. Management protocols and guidelines will likely continue to evolve as additional data on UAL becomes available.

Supplemental Material

The complete survey questionnaire is available online (<https://doi.org/10.5070/RS43460726>).

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The CBIIG permitted the distribution of the survey to its members.

Author Contributions

Conceptualization, all authors; Acquisition, analysis, and interpretation of data, all authors.; Writing – original draft preparation, C.B.W.; Review and editing, all authors.; Supervision, D.M.I., J.S.C. All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Disclosures

None to report.

Table 1. Society of Breast Imaging (SBI) Guidelines for the Management of Unilateral Axillary Lymphadenopathy (UAL) After Recent COVID-19 Vaccination.

Criteria	SBI 2021 Guidelines ¹³	SBI February 2022 Revised Guidelines ⁷
Delay of screening mammography exam around the time of vaccination	Before the first dose or 4-6 weeks after the second dose	No delay
Collect information on vaccination status on patient intake forms, including date and side	Yes	Yes
Screening mammogram shows UAL after a recent ipsilateral vaccination with no other suspicious finding	BI-RADS 0	BI-RADS 2 can be considered
Follow-up interval for UAL with a BI-RADS 3 assessment	4-12 weeks	12 weeks or more
If this BI-RADS 3 follow-up shows persistent but improved UAL	Biopsy	BI-RADS 2
If this BI-RADS 3 follow-up shows persistent and unchanged UAL		BI-RADS 3 with follow-up 6 months after initial presentation
If this BI-RADS 3 follow-up shows persistent but increased UAL		Biopsy

Abbreviations: BI-RADS, Breast Imaging Reporting and Data System.

Table 2. Survey Responses Related to Recent Vaccination.

Survey Question	Response Choice	No./Total (%)
Do you consider recent ipsilateral COVID-19 vaccination relevant to the interpretation of unilateral axillary lymphadenopathy on breast imaging?	Yes	10/10 (100)
	No	0/10 (0)
Do you consider recent ipsilateral vaccination with other vaccines (non-COVID-19) relevant to the interpretation of unilateral axillary lymphadenopathy on breast imaging?	Yes, all other vaccinations	7/10 (70)
	Only certain vaccinations	0/10 (0)
	No	3/10 (30)
When evaluating unilateral axillary lymphadenopathy on breast imaging, for how many weeks after COVID-19 vaccination do you consider an ipsilateral vaccination relevant to interpretation? (free text response)	6 weeks	3/10 (30)
	8 weeks	1/10 (10)
	12 weeks	5/10 (50)
	12-16 weeks	1/10 (10)
When evaluating unilateral axillary lymphadenopathy on breast imaging, for how many weeks after other non-COVID-19 vaccinations do you consider an ipsilateral vaccination relevant to interpretation? (free text response)	4 weeks	2/7 (29)
	6 weeks	1/7 (14)
	8 weeks	2/7 (29)
	12 weeks	2/7 (29)
Has the length of time you consider non-COVID-19 vaccinations relevant to interpretation changed because of your experience with reactive lymphadenopathy from COVID-19 vaccinations?	Yes	6/7 (86)
	No	1/7 (14)

Table 3. Survey Responses Related to the Assignment of BI-RADS for UAL Based on Findings in the Ipsilateral Breast

A No suspicious finding in ipsilateral breast

Imaging Modality	BI-RADS assignment for UAL, No. (%)					
	0	1	2	3	4	5
Screening Mammogram	4 (40)		3 (30)	3 (30)		
Diagnostic Ultrasound			4 (40)	6 (60)		
MRI	3 (30)		5 (50)	2 (20)		

B BI-RADS 0 or suspicious finding in ipsilateral breast

Imaging Modality	BI-RADS assignment for UAL, No. (%)					
	0	1	2	3	4	5
Screening Mammogram	7 (70)			3 (30)		
Diagnostic Ultrasound					10 (100)	
MRI	2 (20)				8 (80)	

Abbreviations: BI-RADS, Breast Imaging Reporting and Data System; MRI, Magnetic Resonance Imaging; UAL, Unilateral Axillary Lymphadenopathy.

Figure. Response to the Survey Question: "In which settings do you typically assign a Breast Imaging Reporting and Data System (BI-RADS) 4 or 5 to unilateral axillary lymphadenopathy after recent ipsilateral vaccination?"

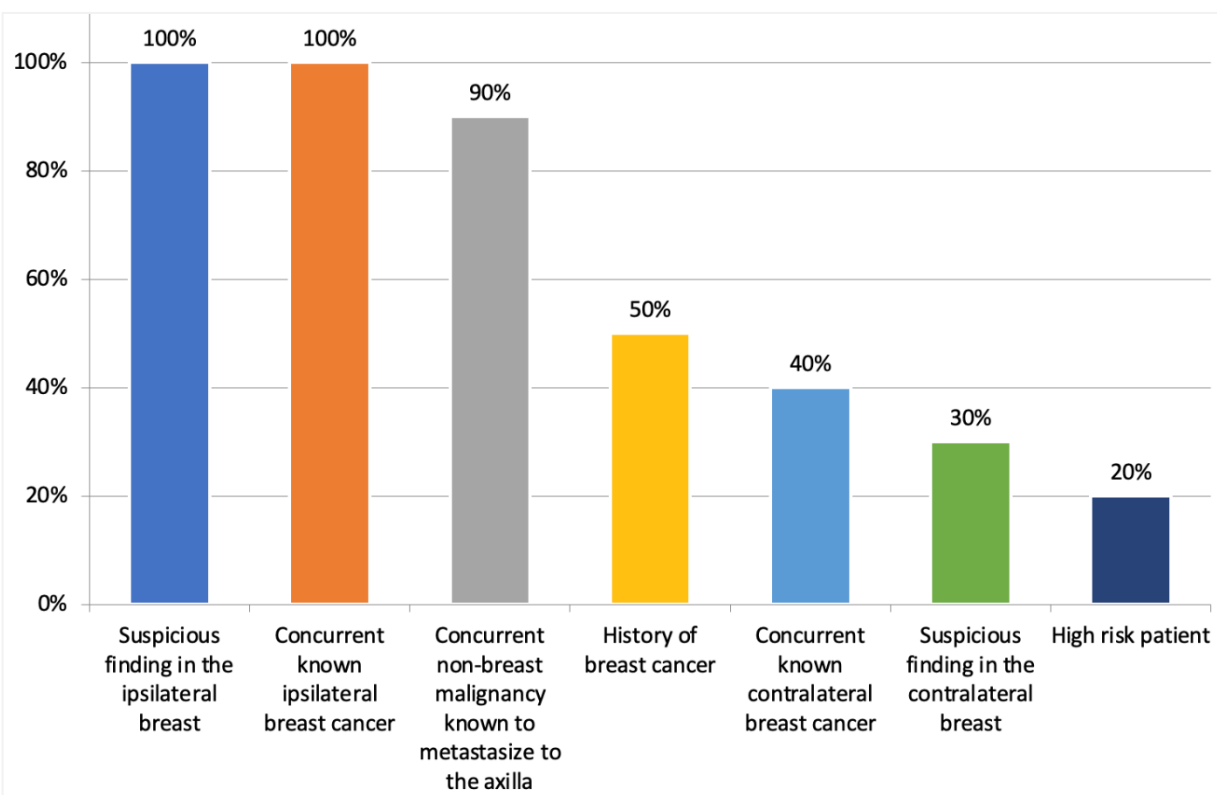


Table 4. Survey Responses Related to the Resolution of Breast Imaging Reporting and Data System (BI-RADS) 3 Assessments.

Survey Question	Response Choice	Responses, No. (%)
What interval follow-up do you initially recommend (please specify in weeks)? (free text response)	4 weeks	1 (10)
	6-8 weeks	1 (10)
	8-12 weeks	2 (20)
	12 weeks	6 (60)
If you recommend follow-up for unilateral axillary lymphadenopathy after a recent ipsilateral vaccination, do you typically recommend follow-up based on time since vaccination or time since imaging?	Based on time since vaccination (eg, 12 weeks after vaccination)	2 (20)
	Based on time since imaging (eg, 12 weeks after current study)	8 (80)
	Never recommend follow-up, always considered benign	0 (0)
	Never recommend follow-up, always considered suspicious	0 (0)
When unilateral axillary lymphadenopathy after a recent ipsilateral vaccination is assigned a BI-RADS 3 and has improved but is still present on initial follow-up, which BI-RADS category do you assign?	BI-RADS 2	10 (100)
	BI-RADS 3	0 (0)
	BI-RADS 4	0 (0)
	BI-RADS 5	0 (0)
When unilateral axillary lymphadenopathy after a recent ipsilateral vaccination is assigned a BI-RADS 3 and is unchanged on initial follow-up, which BI-RADS category do you assign?	BI-RADS 2	0 (0)
	BI-RADS 3	7 (70)
	BI-RADS 4	3 (30)
	BI-RADS 5	0 (0)

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