คุณค่าของการตรวจรอยโรคหินปูนสงสัยมะเร็งโดยใช้เครื่อง Digital Breast Tomosynthesis ช่วยการวางตำแหน่งการตัดชิ้นเนื้อซึ่งขับเคลื่อนเข็มตัดด้วยระบบสุญญากาศ: ประสบการณ์ของโรงพยาบาลมะเร็งลพบุรี

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Value of Digital Breast Tomosynthesis-guided Vacuum-assisted Biopsy (DBT-VAB) in Diagnosis and Management of Suspicious Non-mass Microcalcifications of Breast: An Experience of Lop Buri Cancer Hospital

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Abstract

Background: DBT-VAB is an alternative to surgical biopsy for early breast cancer detection when presented as calcifications without a mass. However, there is a possibility of pathologic underestimation. Objective: To evaluate malignancy rate and pathologic upgrade rate in suspicious calcifications via DBT-VAB. Method: A retrospective analysis of 98 patients (104 DBT-VAB procedures) was performed. Surgical pathology served as the gold standard for high-risk and malignant groups, with a 1-year follow-up for the benign group. The median follow-up was 51 months. Result: Malignancy rate: 29.8%, total upgrade rate: 21%. Breast MRI and MRI-guided biopsy detected one false negative. Final malignancy rates: BIRADS 4B: 27%, 4C: 56%, 5: 100%. Fine linear calcifications showed a malignancy rate of 70%, while linear and segmental distributions had rates of 100% and 60% respectively. Malignancy rates for calcifications related to BIRADS 3 follow-up, increasing calcifications, new calcifications, stable calcifications: 25%, 40%, 44%, 33% respectively. One-third of developing calcifications in benign background were malignant. Success rate: 98%, complications: small hematomas (15.3%), vasovagal reactions (2%), marker migration (24.4%). Conclusion: DBT-VAB is a safe, minimally invasive, and accurate tool for diagnosing and planning the management of suspicious calcifications without masses, with a relatively low pathologic upgrade rate. High-risk and malignant lesions require surgery, while benign results enable reliable follow-up.

Keywords: Early breast cancer, DBT-VAB, Suspicious calcifications, Pathologic upgrade rate

บทคัดย่อ

ภูมิหลัง: การพิสูจน์เนื้อด้วยอุปกรณ์ประกอบกับเครื่องแมมโมแกรม 3 มิติ และใช้ร่วมกับระบบดูดเนื้อสุญญากาศ (DBT-VAB) ช่วยวินิจฉัยมะเร็งเต้านมระยะแรกที่มาด้วยหินปูนที่น่าสงสัยมะเร็งเต้านม โดยไม่มีก้อนเนื้อร่วมด้วย กำหนดเป้าหมายได้แม่นยำ และแผลเล็กกว่าการผ่าตัด แต่ยังมีโอกาสที่ผลเนื้อจะ underestimate วัตถุประสงค์: หาอัตราการเกิดมะเร็ง และอัตราการเปลี่ยนเป็นมะเร็งในผลเนื้อสุ่มเสี่ยง หรือเปลี่ยนจากมะเร็งเต้านมระยะไม่ลุกลามเป็นชนิดลุกลาม ในผู้ป่วยที่

พบหินปูนที่น่าสงสัยในเต้านมด้วยวิธี DBT-VAB **วิธีการ:** ศึกษาย้อนหลังผู้ป่วย 98 ราย, 104 รอยโรคหินปูน ที่ตัดชิ้นเนื้อด้วยวิธี DBT-VAB กลุ่มผลเนื้อสุ่มเสี่ยงและมะเร็งใช้ผลพยาธิวิทยาของการผ่าตัดเป็นมาตรฐาน ส่วนผลเนื้อธรรมดาใช้การตรวจติดตามด้วยแมมโมแกรมที่ระยะเวลาอย่างน้อย 1 ปีเป็นเกณฑ์ ระยะติดตามเฉลี่ยที่ 51 เดือน **ผล:** อัตราการเกิดมะเร็งเท่ากับ 29.8%, อัตราการเปลี่ยนเป็นมะเร็งในผลเนื้อสุ่มเสี่ยง และเปลี่ยนจากมะเร็งระยะไม่ลุกลามเป็นชนิดลุกลามรวมเท่ากับ 21% ผู้ป่วย 1 รายให้ผลลบลวง พิสูจน์ด้วยการตรวจคลื่นแม่เหล็กไฟฟ้าและตัดชิ้นเนื้อโดยใช้ MRI นำ ผลมะเร็งสุดท้ายเท่ากับ 27%, 56% และ 100% ใน BIRADS 4B, 4C และ 5 ตามลำดับ โอกาสเป็นมะเร็งสูง 70% ในลักษณะหินปูน fine linear และกระจายตัวแบบ linear (100%) และ segmental (60%) ผลมะเร็งสุดท้ายในกลุ่มที่เคยติดตามแบบ BIRADS3, กลุ่มหินปูนเพิ่มขึ้น, กลุ่มหินปูนเกิดขึ้นใหม่และกลุ่มหินปูนที่ไม่เปลี่ยนแปลงในกลุ่มที่ตรวจแมมโมแกรมประจำปี เท่ากับ 25%, 40%, 44% และ 33% ตามลำดับ หนึ่งในสามของกลุ่มหินปูนที่เพิ่มขึ้นหรือเกิดขึ้นใหม่ในแมมโมแกรมที่มีหินปูนที่ไม่น่าสงสัยมะเร็งกระจายตัวอยู่ พบว่าเป็นมะเร็งเมื่อพิสูจน์ชิ้นเนื้อ อัตราความสำเร็จของหัตถการ DBT-VAB เท่ากับ 98% พบก้อนเลือดคั่งขนาดเล็ก 15.3%, เกิด vasovagal reaction 2% และพบอัตราเคลื่อนตัวของหมุดระบุตำแหน่ง 24.4% **สรุป:** DBT-VAB เป็นหัตถการที่ปลอดภัย แผลเล็ก น่าเชื่อถือ ช่วยในการวินิจฉัยและวางแผนการรักษาผู้ป่วยที่มาด้วยหินปูนโดยคลำไม่พบก้อนในเต้านม โดยที่ pathologic upgrade rate ค่อนข้างต่ำ ผู้ป่วยที่ผลเนื้อสุ่มเสี่ยงต้องพิสูจน์ต่อโดยการผ่าตัด ผลเนื้อมะเร็งรักษาต่อด้วยการผ่าตัด ผลเนื้อธรรมดาสามารถติดตามต่อด้วยแมมโมแกรมได้

คำสำคัญ: มะเร็งเต้านมระยะแรก, DBT-VAB, หินปูนที่น่าสงสัยมะเร็งเต้านม, Pathologic upgrade rate

Introduction

Suspicious calcifications detected on mammography often necessitate breast biopsies to distinguish between early breast cancer and benign breast diseases. While conventional prone stereotactic-guided breast biopsy has been the standard procedure for diagnosing breast calcifications,[1-3] the advent of digital breast tomosynthesis (DBT) mammography has introduced a new technology that improves lesion detection and localization. DBT-guided biopsy, which is an add-on module to the mammography machine, offers a more practical approach for performing breast biopsies.[4-7]

Vacuum-assisted biopsy (VAB), when combined with stereotactic or DBT-guided biopsy using a large aperture needle, has enhanced tissue sampling adequacy. Studies have shown that VAB achieves comparable diagnostic accuracy to surgical biopsy, with lower rates of pathologic underestimation, reduced need for surgical procedures, and improved treatment planning for surgeons, thereby reducing patient anxiety.[1-3]

In daily practice, we face challenges detecting, interpreting, and deciding on biopsies for breast calcifications without masses. Using a 14-gauge core needle often yields inadequate samples or underestimations. Wire localization for excision is invasive and leads to significant scarring. Additionally, the traditional 2D prone stereotactic-guided biopsy is cumbersome and time-consuming, requiring two views for depth assessment (z-axis). This process raises both radiation exposure and patient discomfort.

The objective of this study was to examine the malignancy rate and pathologic upgrade rate in cases where suspicious calcifications were identified on mammography and subsequently underwent DBT-VAB at our hospital over a ten-year period following the installation of the new technology machine.

Materials and methods

Our hospital's Ethics Committee approved this retrospective cohort study in November 2022. We included all patients who underwent DBT-VAB for calcifications between November 2012 and December 2022 in our study, totaling 98 patients (104 lesions; 6 patients with two lesions). We excluded 9 patients with incomplete follow-up for benign biopsies, 5 with malignancies

lacking surgical pathology, and 1 with incomplete medical record data. Informed consent was obtained from all women at the time of the procedure. We conducted a retrospective review of imaging findings, medical records, and pathology reports. The collected data included age, personal cancer history, familial breast cancer history, DBT-VAB pathology, surgical pathology (if available) in the malignant and high-risk biopsy groups, as well as radiological follow-up (for a minimum period of 1 year) in the benign biopsy group, which served as the gold standard reference. The comparison between surgical pathology and DBT-VAB pathology determined the rate of pathologic upgrades.

Mammographic findings, including breast density, morphology, distribution, location, and stability of calcifications, were assessed according to the ACR BI-RADS 2013 atlas. DBT-VAB procedures were performed using a 9G vacuum biopsy device (Eviva, Hologic) and the Affirm guidance system, which is installed as an add-on to mammography machines (Selenia Dimensions and 3Dimensions, Hologic). The procedures were done with the patient in a sitting position. The target lesion was identified using DBT, and the shortest approach was chosen. Local anesthesia was administered, and pre- and post-fire images were obtained to confirm needle position. Biopsy specimens were collected in two rounds. The biopsy cavity was lavaged with normal saline until the fluid was clear. Afterward, a marker was inserted into the biopsy cavity if adequate sampling was observed in the specimen radiograph. In cases of inadequate sampling, the biopsy could be repeated immediately. Tissue cores were separated based on calcification presence and preserved in formalin. Post-procedure mammography was performed to document residual calcifications, marker position, and any hematoma. Success rate, complications, and marker migration were evaluated. Basic statistical analysis using median, range, and percentages was conducted for data analysis.

Result

The median age of the patients was 54 years (range, 31-79 years). The successful rate of DBT-VAB was 98% (102/104). Two calcification retrievals failed due to small, faint, amorphous calcifications located high and deep. Pathology confirmed benign breast tissue. One patient had a 44-month follow-up with no radiographic changes, while the other opted for DBT-guided wire localization, confirming benignity during surgery. Small hematomas occurred in 15 patients, 2 patients experienced a vasovagal reaction and marker migrations were observed in 22 lesions (22/90) on post-procedure mammographic films. In 14 lesions, the markers were not placed in the biopsy cavities due to obvious residual calcifications.

The malignancy rate of DBT-VAB was 29.8%. The biopsy results are shown in Table 1. In the malignant and high-risk biopsy groups, almost all patients underwent surgery, with only one exception. One patient who was diagnosed with biopsy-proven intermediate-grade Ductal carcinoma in situ (DCIS) did not undergo surgery due to the patient's refusal based on her advanced age (79 years old). Instead, active surveillance mammography was chosen, and no new suspicious calcifications developed during the 48-month follow-up period.

In the high-risk biopsy group, 30% (3 out of 10 lesions) exhibited a pathological upgrade to malignancy post-surgery, as detailed in Table 2. Of the 28 DCIS lesions that underwent surgery, 5 were upgraded to invasive ductal carcinoma (IDC), resulting in a DCIS upgrade ratio of 17.9% (5/28). The overall upgrade rate during surgery amounted to 21% (8/38). Additionally, one case was initially diagnosed as benign (fibrocystic change) through DBT-VAB but was later confirmed as high-grade DCIS through MRI-guided biopsy (false negative case) (Figure 1).

No malignancies were detected during follow-up studies in the benign biopsy group. The median follow-up time for all patients was 51 months (range, 13-105 months).

Table 1: pathologic results on DBT-VAB	No.
Benign lesions (n = 63)	
Fibrocystic change	16
Fibroadenoma and fibroadenomatoid hyperplasia	19
Adenosis, fibrosis	6
Sclerosing adenosis	3
Columnar lesion, columnar cell change, columnar hyperplasia	9
Dilated ducts with calcifications	3
Usual ductal hyperplasia	1
Breast tissue	5
Increased fibrous stroma and calcified wall of medium size artery	1
High risk lesions (n = 10)	
Atypical ductal hyperplasia (ADH)	4
Flat epithelial atypia (FEA)	2
Columnar lesion with focal mild atypia	1
Dilated ducts with mild atypia	1
papilloma	2
Malignant lesions (n = 31)	
Ductal carcinoma in situ (DCIS)	29
Invasive ductal carcinoma (IDC)	2

Table 2: pathologic upgrade lesions	
Patho_biopsy (high risk group)	**Patho_surgery**
FEA	DCIS, low to intermediate grade
ADH	Tubular carcinoma
ADH	DCIS, intermediate grade
Patho_biopsy (malignant group)	**Patho_surgery**
DCIS, high grade	IDC+DCIS
DCIS, intermediate grade	IDC
DCIS, high grade + suspicious invasive	IDC+DCIS
DCIS, high grade	IDC
DCIS, high grade + suspicious invasive	IDC+DCIS

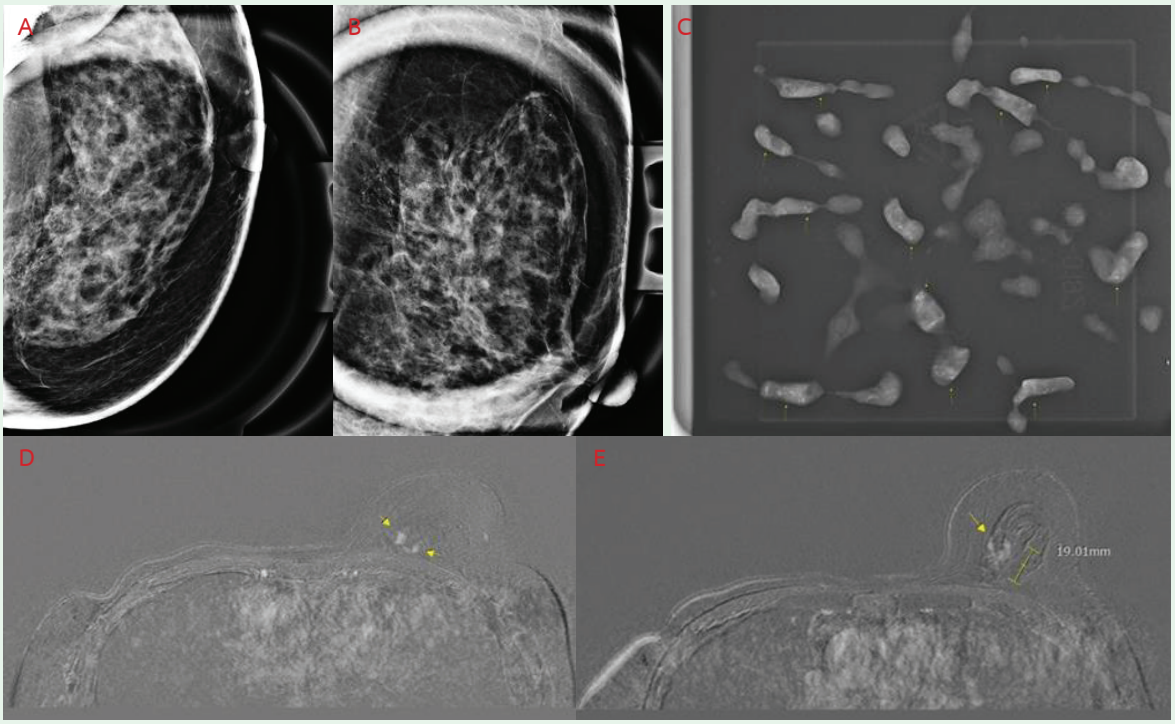

Figure 1. BIRADS 4C calcifications were observed on left mammography (A, B) with adequate retrieval of calcifications on the specimen radiograph (C), yielding a benign pathological result. Subsequent follow-up MRI (D, E) showed an increased area of non-mass enhancement (NME), prompting a re-biopsy decision by the radiologist, which confirmed malignancy.

From the analysis of Table 3, advanced age and higher breast density did not lead to an increased malignancy rate. The malignancy rate was higher in patients with a family history (FHx) of breast cancer compared to patients with a personal history (PHx) of breast cancer (56% vs. 39%). An even higher malignancy rate was observed in patients who had two risk factors, including both FHx of breast cancer and PHx of breast cancer, or FHx of breast cancer and PHx of other cancers (67% vs. 100%). One patient had two cancers (CA colon and CA endometrium) and also had a FHx history of breast cancer, indicating strong risk factors. Bilateral synchronous breast cancers were detected on screening mammography in this patient. Among the 44 patients with a PHx of breast cancers, four were confirmed to have multicentric breast cancers, and 14 were diagnosed with bilateral breast cancers (including five cases of synchronous cancers). One of these cases involved both multicentric and metachronous bilateral breast cancers. Another patient had a recurrent cancer near the previous site of breast conserving therapy (BCT) scar. The relationship between mammographic data and percentage of final malignancy can be observed in Table 3 and 4.

Table 3: Demographic and mammographic data of 104 lesions underwent DBT-VAB related to percentage of final malignancy

Demographic and mammographic data	No. of malignancy	No. of high risk (upgrade lesion)	No. of benign	Total no.	% of final malignancy
Age at biopsy					
< 40 years old	2	-	2	4	50
40-49	8	4 (CA1)	19	31	29
50-59	16	2 (DCIS1)	23 (FN/ DCIS1)	41	44
60-69	3	4 (DCIS1)	16	23	17
70-79	2	-	3	5	40
Breast density					
a= almost entirely fatty	1	-	-	1	100
b= scattered areas of fibroglandular density	3	3 (DCIS1)	6	12	33
c= heterogeneously dense	27	7 (DCIS1, CA1)	57 (FN/ DCIS1)	91	33
d= extremely dense	-	-	-	-	
Location					
Right breast	11	5 (DCIS1)	30	46	26
Left breast	20	5 (DCIS1, CA1)	33 (FN/ DCIS1)	58	40
FHx breast CA	4	2 (DCIS1)	3	9	56
FHx breast CA+ PHx breast CA	2	1	-	3	67
FHx breast CA+ PHx other CA	2	-	-	2	100
Pure PHx breast CA	14	6 (DCIS1, CA1)	24 (FN/ DCIS1)	44	39
Pure PHx other CA	2	-	4	6	33
BIRADS 3 follow-up calcifications (n = 20)	5	3	12	20	25
Compared to prior yearly MMG (n= 29)					
Increasing calcifications	3	1 (CA1)	6	10	40
New calcifications	7	-	9	16	44
Stable calcifications	1	-	2	3	33
Background diffuse benign looking calcifications (n = 15)	5	1	9	15	33

Demographic and mammographic data	No. of malignancy	No. of high risk (upgrade lesion)	No. of benign	Total no.	% of final malignancy
BIRADS					
2	-	-	1	1	0
4B	21	7 (DCIS1, CA1)	56	84	27
4C	7	3 (DCIS1)	6 (FN/ DCIS1)	16	56
5	3	-	-	3	100

Malignancy = DCIS+IDC, CA = tubular carcinoma, FN = false negative case, other CA = CA colon/ rectum (5), CA endometrium+ CA colon (1), mucinous tumor of appendix (1), CA thyroid (1)

Table 4: Frequency of malignancy as a function of both morphology and distribution after pathologic upgrade

Morphology descriptor	Distribution descriptor, no. (%) of lesions					Total no. (%) of lesions
	diffuse	regional	clustered	segmental	linear	
Punctate	NA	NA	0/1 (0) **Birads 2**	NA	NA	0/1 (0)
Coarse heterogeneous	NA	NA	0/7 (0) **Birads 4B**	NA	NA	0/7 (0) Total benign (fibroadenomas)
Amorphous	NA	1/2 (50) **4B;** DCIS1	15/59 (25) **4B;** DCIS13, IDC1, tubular CA1	3/6 (50) **4C;** DCIS2, IDC1	NA	19/67 (28) DCIS16, IDC2, CA1
Pleomorphic	NA	NA	7/16 (44) **4B;** DCIS4, IDC3	1/2 (50) **4C;** IDC1	1/1 (100) **4C;** DCIS1	9/19 (47) DCIS5, IDC4
Linear	0/1 (0) **4C**	1/1 (100) **4C;** DCIS1	3/5 (60) **4C;** DCIS3	2/2 (100) **B5;** DCIS1, IDC1	1/1 (100) **B5;** DCIS1	7/10 (70) DCIS6, IDC1
Total	0/1 (0)	2/3 (67)	25/88 (28)	6/10 (60)	2/2 (100)	35/104 (33.7)

NA = no case available, CA = tubular carcinoma

Discussion

Our hospital achieved a high success rate of 98% in performing DBT-VAB, which aligns well with the findings of Ido et al. (96.5%)[6] and Schrading et al. (100%).[7] DBT-VAB offers several advantages over 2D prone stereotactic-guided biopsy. It allows for easier positioning and identification of calcifications using a single DBT view, and precise targeting of the lesion with a single click. The software automatically calculates the coordinates, enabling the radiologist to rotate the biopsy needle 360 degrees in a single insertion.[4-7, 8] DBT-VAB provides comparable tissue sampling quality and quantity to surgical biopsy, resulting in improved diagnostic accuracy and reduced pathologic upgrade rates, while being safe and less invasive.[1-3, 8]

In our study, the malignancy rate of DBT-VAB was 29.8%, which aligns with the findings of other studies (13.6%, 19.7%, 38.34%).[1, 2, 3] Our study supports the use of calcification morphology and distribution as reliable predictors of malignancy[9, 10, 11]. We found that linear calcifications had a 70% malignancy rate (53% to 81% in literature), pleomorphic calcifications had a 47% malignancy rate (28% to 29% in literature), amorphous calcifications had a 28% malignancy rate (13% to 26% in literature), and coarse heterogeneous calcifications showed no malignancy (7% to 20% in literature).[9] Table 4 showed that linear calcifications in linear and segmental distributions had a 100% malignancy rate, consistent with BIRADS 5 classification (PPV ≥ 95%). Linear calcifications in clustered or regional distributions, as well as pleomorphic and amorphous calcifications arranged in linear or segmental distributions, should be classified as BIRADS 4C (PPV > 50% to < 95%). Pleomorphic calcifications in clustered distributions and amorphous calcifications in clustered or regional distributions should be classified as BIRADS 4B (PPV >10% to 50%). Our results align with the

BIRADS 2013 atlas.[9] Notably, all coarse heterogeneous calcifications in clustered distributions were proven to be benign (fibroadenomas), which slightly differs from the literature.[9]

There was one case of diffuse linear calcifications in a patient who had developed calcifications 2 years after BCT. The biopsy of these calcifications confirmed benign (increased fibrous stroma and calcified wall of a medium-size artery). Upon retrospectively reviewing the images and reaching a consensus between two radiologists, it was determined that the appearance of these calcifications resembled large rod-like macrocalcifications, which could be attributed to secretory disease or the effect of fat necrosis resulting from radiation therapy.

BIRADS 3 follow-up calcifications are often initially described as clustered punctate and amorphous calcifications. These calcifications typically have faint density and form small groups, posing challenges for performing DBT-VAB. However, if there is an increase in density or amount, or a slight change to a more suspicious morphology, they are reclassified as BIRADS 4, and a biopsy is performed. Among these lesions, 25% (5/20) were found to have DCIS.

In cases where prior yearly images were available for comparison, new calcifications showed a slightly higher likelihood of being malignant compared to increasing calcifications (44% vs. 40%). However, it is important to consider that these calcifications appeared as small groups with faint density in the old images, and spot magnification view was not performed. The absence of spot magnification views may have limited the ability to accurately assess the morphology and distribution of the calcifications, potentially leading to an underestimation of their suspicious nature.[5, 8, 9]

One out of three cases with stable calcifications showed malignancy (IDC+DCIS) upon biopsy. These calcifications were clustered punctate and amorphous, and there were no changes in follow-up images for over 4 years. Biopsies performed on two other cases with stable clustered calcifications (one punctate and one amorphous) after more than 2 years of follow-up confirmed them as benign. These findings highlight that calcification stability alone is not a reliable indicator for excluding malignancy. The morphology of the calcifications is a more significant factor in assessing their potential malignancy.[11]

Out of the 15 developing calcifications in the background of diffuse benign-looking calcifications, 5 were confirmed to be malignancies (3 DCIS lesions, 2 IDC lesions). Pathologically proven benignity accounted for 10 out of 15, and they were typically associated with diffuse punctate and amorphous calcifications or diffuse multiple clustered coarse heterogeneous calcifications, especially when present in both breasts. However, it is important to be cautious of any slight changes or small developing groups of suspicious calcifications, as they can be difficult to detect. Comparing prior mammography and spot magnification views can be helpful in assessing the changes and making an accurate diagnosis.

The total pathologic upgrade rate was 21%, which was higher compared to other studies (7.7%[2], 8.2%[6], 0%[7]) (with a range of 0-17% in the literature).[2] The upgrade ratio for DCIS was 17.9%, compared to the 6.1% reported by Esen et al.[2] Notably, 4 out of 5 upgraded lesions were high-grade DCIS, and two of these lesions displayed a suspicious invasive component based on DBT-VAB pathology, already indicating a propensity for progressing to invasive cancer.

In our study, we encountered only one false negative case, demonstrating a high accuracy in detecting malignant lesions. This case was resolved using breast MRI and MRI-guided biopsy to identify the malignancy.

In the benign biopsy group, none of the lesions showed any signs of malignancy on

mammographic follow-up over a minimum period of one year. This suggests that the benign diagnoses were accurate, and no malignancies were missed during the evaluation.

In our experience, DBT-VAB success relies on effective communication among the technologist, radiologist, and patient for precise targeting and efficiency. Proper breast positioning is crucial, and minimizing excessive local anesthesia is key to preventing target area shifts. This technology simplifies making target readjustments after lidocaine injection. Our hematoma rate was higher when compared with the literature[6, 7], even though we safeguarded vessels by observing DBT image shadows pre-procedure. In the future, we plan to reduce hematoma rates by lavaging the biopsy cavity with cold saline, replacing the room-temperature normal saline, followed by 5-10 minutes of local pressure compression post-procedure. Our hypothesis is that reducing the hematoma rate can likely decrease marker migration, facilitating ultrasound or DBT-guided wire localization for surgical planning.

Upright DBT-VAB faces limitations with thin breasts, obstructed vessels, and hard-to-reach lesions (e.g., superficial or posterior). To overcome these challenges, we use smaller aperture (petite) needles or adapt the approach for thin breasts, reposition breasts to clear vessels from the biopsy path, and utilize Akrus, a flexible positioning armchair for lateral decubitus positioning to enhance access and comfort. When DBT-VAB is not feasible, we opt for DBT-guided wire localization as an alternative.

We believe that adding functional imaging, such as breast MRI or contrast-enhanced mammography can expedite biopsy decisions and may help increase biopsy target accuracy, reducing the risk of delayed malignancy diagnosis, especially in challenging cases. For example, in cases of diffuse calcifications in the background, misinterpretation as benign and delayed biopsy can lead to changes in staging and poorer treatment outcomes. We plan to conduct a study on this in the future.

This study highlights the importance of vigilance among radiologists when detecting small, suspicious calcifications on mammography. It emphasizes the need for spot magnification views to ensure accurate interpretation. Furthermore, it provides valuable insights into the success, accuracy, and potential complications associated with DBT-VAB, facilitating effective communication between radiologists and surgeons when helping patients choose a method for diagnosing breast calcifications without a mass. This review also aids our team in evaluating diagnostic strengths and weaknesses, guiding us toward future enhancements in patient care. Limitation of our study was small population of suspicious calcifications performed DBT-VAB limited the statistical powering.

Conclusion

DBT-VAB is a safe, minimally invasive, and effective method for sampling suspicious calcifications, providing reliable diagnostic information with a relatively low pathologic upgrade rate. Our malignancy rates align with BIRADS 2013, confirming DBT-VAB accuracy. Additional imaging and follow-up are important when necessary. Radiologist perception and magnification views are crucial for early breast cancer detection.

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