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Breast schwannoma: A case report and brief review of literature

Haneul Ryou, Hongxiu Ji, April Phantana-angkool

ABSTRACT

Introduction: Schwannoma is a type of tumor deriving from Schwann cells of the peripheral nerves. Schwannomas have the potential to develop anywhere in the body where peripheral nerves exist; breast schwannomas are particularly rare.

Case Report: This case reports an occurrence of breast schwannoma observed over a five-year period in Washington. Initial identification of the mass presented with low-level internal echoes, moderate peripheral vascularity, and questionable internal vascularity. Five-year follow-up demonstrated mild increase in size and development from an initially well circumscribed hypoechoic lesion to growing not-well circumscribed margins. Core biopsy and pathology showed evidence of palisading and diffusely positive S100, confirming diagnosis of schwannoma. The patient underwent surgical excision.

Conclusion: This case opens discussion for the potential of long-term follow-up for benign masses as alternatives to immediate surgical excision.

Keywords: Breast surgery, Imaging, Palpable breast mass, Schwannoma

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INTRODUCTION

Schwannoma, also called “neurinoma” or “neurilemmoma,” is a type of tumor deriving from Schwann cells of the peripheral nerves [1, 2]. Schwannomas have the potential to develop anywhere in the body where peripheral nerves exist, but are most commonly found in the head, neck, and external extremities [1, 3, 4]. Schwannoma affects less than 200,000 people each year in the United States [5]. Breast schwannomas are particularly rare, only accounting for 2.6% of all schwannomas; 0.2% of all breast neoplasms are classified as schwannomas [2, 6]. This case study reports an occurrence of breast schwannoma observed over a five-year period in Washington, United States. Typically, breast schwannomas are surgically removed due to uncertainty regarding their malignancy; we discuss potential alternatives to surgical excision in the management of breast schwannoma.

CASE REPORT

A 42-year-old female presented with a five-year history of right breast mass along the axillary tail. She did not have any pain associated with the mass. At the age of 38 years, she had a bilateral diagnostic mammogram and right breast ultrasound for palpable right breast mass (Figure 1). Breast ultrasound of the right breast showed a circumscribed hypoechoic lesion measuring 6 × 4 5 mm at the 10 o’clock position

direction 13 cm from the nipple/axillary tail. It had a thin hypoechoic tract extending to the skin. There were low-level internal echoes, moderate peripheral vascularity, and questionably some internal vascularity. Due to the peripheral vascularity, the lesion was classified as BI-RADS 4A and surgical excision was recommended.

This patient had a six-month follow-up right breast ultrasound. There was a 5 × 4 × 7 mm circumscribed right breast mass at 10 o'clock position 13 cm from the nipple. No interval changes were noted, and the lesion was classified as a BI-RADS 3. Three years later (2020), follow-up ultrasound showed hypoechoic mass abutting the skin surface measuring 9 × 5 × 8 mm, indicating mild increase in size. BI-RADS 2. Subsequent bilateral screening mammograms showed slight interval increase in size of right breast mass. It was categorized as BI-RADS 2.

This patient then had another annual bilateral screening mammogram at a different facility in 2023 (Figure 1C). Enlarged right breast mass was noted along with nodular asymmetry of the right breast. Right diagnostic mammogram showed the nodular asymmetry in the right breast resolved with spot compression. In the right breast 10 o'clock position 13 cm from the nipple at the axillary tail, there was a hypoechoic mass measuring 8 × 6 × 10 mm with margins not well circumscribed (Figure 2C). Hypervascularity was noted, and this lesion was classified as a BI-RADS 4B. A core biopsy was recommended to rule out malignancy (Table 1).

Ultrasound-guided core biopsy was performed. Pathology showed a low-grade spindle cell neoplasm of variable cellularity and having small to intermediate-sized nuclei, indistinct nucleoli, and indistinct cell borders with areas suggestive of palisading. Foci of blood vessels with a hyalinized appearance are present. Mitoses are rare and no necrosis is identified. Immunohistochemistry demonstrated that the lesional cells were diffusely positive for S100, SOX10, and CD56 expression (Figure 3) and negative for pancytokeratin (AE1/AE3), p63, CD34, desmin, and beta-catenin expression. The results were consistent with schwannoma and argued against other low grade spindle cell lesions, such as metaplastic carcinoma, solitary fibrous tumor, spindle cell lipoma, leiomyoma, and fibromatosis. She subsequently underwent surgical excision of the lesion, which showed a 9 mm spindle cell neoplasm, consistent with schwannoma, with biopsy changes, biopsy clip, and negative surgical resection margins (Figure 4). Her postoperative course was uneventful; one year follow-up mammogram after surgical excision showed no recurrence.

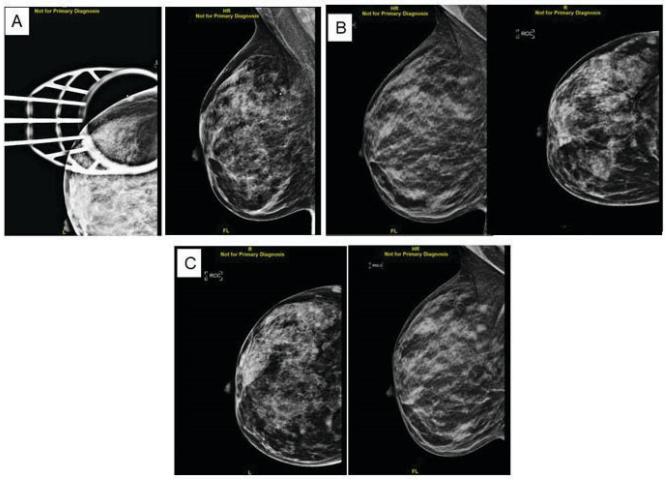

Figure 1: Bilateral diagnostic mammogram and ultrasound. (A) Obtained in 2017, (B) Obtained in 2021, (C) Obtained in 2023.

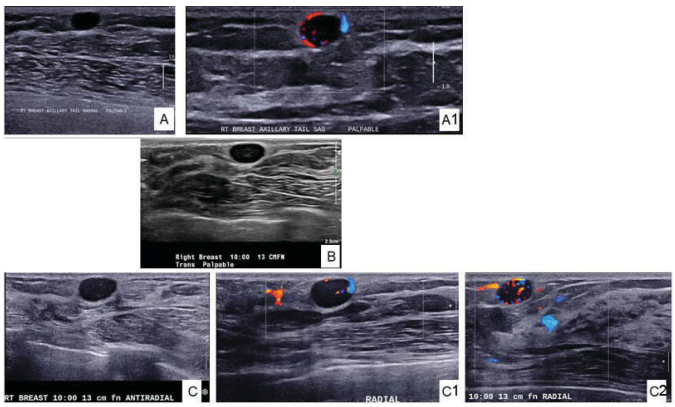

Figure 2: Sonogram. (A) Obtained in 2017, (B) Obtained in 2020, (C) Obtained in 2023.

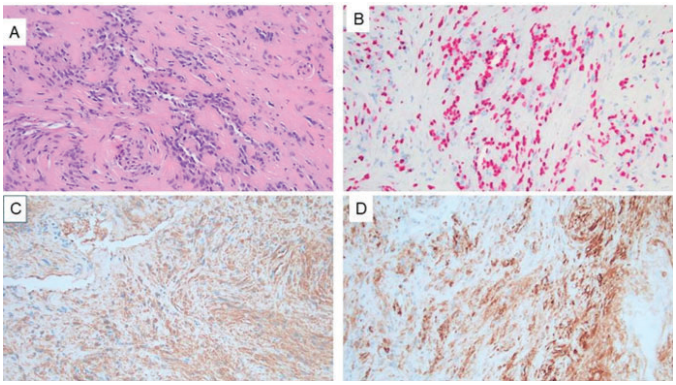

Figure 3: (A) H&E histology on core biopsy. (B) SOX10 stain. (C) S-100 stain. (D) CD56 stain. (Magnification: ×200).

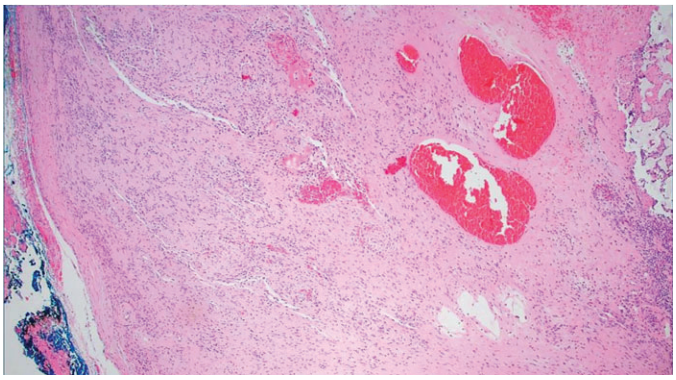

Figure 4: Resected circumscribed bland spindle cell mass showing histologic features consistent with schwannoma (Magnification ×50).

Table 1: BI-RADS progression of patient's mass, 2017–2023

Year	BI-RADS score	Findings
2017	4A	6×4×5 mm hypoechoic circumscribed mass, low-level internal echoes, moderate peripheral vascularity
2017 (6-month follow-up)	3	5×4×7 mm hypoechoic circumscribed mass, no significant interval changes noted
2020	2	9×5×8 mm, mild increase in size
2023	4B	8×6×10 mm, margins not well-circumscribed, hypervascularity noted; core biopsy recommended

The progression of our patient's mass and associated BI-RADS score from date of incidence (2017) to removal (2023).

DISCUSSION

Schwannoma, also called "neurinoma" or "neurilemmoma," is a rare type of tumor deriving from Schwann cells of the peripheral nerves [1, 2]. Schwann cells are specialized to help myelinate the axons and regulate signal transduction [1]. Schwannomas have previously been described as encapsulating tumors which have the potential to develop anywhere in the body where peripheral nerves exist, but are most commonly found in the head, neck, and external extremities [1, 3, 4, 7]. Schwannoma affects less than 200,000 people each year in the United States [5]. Breast schwannomas are particularly rare, only accounting for 2.6% of all schwannomas; 0.2% of all breast neoplasms are classified as schwannomas [2, 6]. The first case of breast schwannoma was reported in 1973 by Collins et al., and our review of the English literature found 41 cases of breast schwannoma to date, not including this case (Table 2) [2, 3, 4, 8–16].

Typically, schwannomas are benign and slow growing, most often described in case reports as painless, palpable masses [7, 17]. Most cases are found to be spontaneous in origin [17]. Limited correlation has been found to certain genetic disorders such as neurofibromatosis type-2 (NF2), schwannomatosis, and Carney complex [10, 18].

Clinically, breast schwannoma tends to occur in female patients, though few cases report occurrence in male patients [10, 19]. Reported cases of breast schwannoma occur in patients with a mean age of 48.6, ranging from 18 to 83 years and with a median age of 45 [8]. It may occur in all four quadrants of the breast in equal likelihoods [2]. Similar to schwannomas occurring in other parts of the body, breast schwannomas are benign, slow growing, and palpable masses which usually occur without pain. While some occurrences could be associated with pain, pain or neurologic manifestations are not common before the tumor exhibits sizable growth [4, 18].

Breast schwannomas can be identified by imaging such as mammography and ultrasound. On mammography, they appear as a nonspecific, well-defined mass presenting in a round or ovular fashion [10]. On ultrasound, they present as well-defined, hypoechoic masses with circumscribed margins and different extents of posterior acoustic enhancement [10]. In certain cases, these masses may also have a cystic component [19]. Diagnosis of schwannoma may be confirmed through histopathologic examinations [10, 18].

Upon histopathologic examination, schwannomas consist of two different cellular arrangements of the tissue—Antoni A and Antoni B—in varying proportions. Antoni A regions are densely packed bundles within a collagenous stroma, presenting as nuclei with an elongated and palisading pattern called Verocay bodies. Conversely, Antoni B regions are hypocellular areas with loose stroma and myxoid exchange [10, 20]. In addition to these histopathologic findings, diagnosis of schwannoma may be confirmed through diffusely positive S-100 stains on immunohistochemistry (IHC) [3, 4, 19].

It is important to distinguish benign schwannomas from differential diagnoses that present similarly. Other low-grade spindle cell tumors such as myofibroblastoma and metaplastic carcinoma can be ruled out through lack of reactivity to S-100 protein in IHC [4]. The malignant counterpart to schwannomas, or malignant peripheral nerve sheath tumors (MPNST), are also described histopathologically as densely arranged spindle cells interspersed with hypocellular myxoid areas [21]. Given the relatively nonspecific nature of MPNST on histology, tumor cells weakly positive for S-100 and negative C-10 may differentiate MPNST from schwannoma [21]. In certain cases, MPNST may present with a determining factor of high mitotic activity [22].

In managing benign breast tumors, general principles may be followed to aid diagnosis and treatment. Kopan's Breast Imaging states that 6-month follow-up for two years followed by routine annual screenings is appropriate for lesions that seem benign [15]. Typically, breast schwannomas are categorized as a BI-RADs 4A lesion given minimal malignant potential [15, 18]. However, there are no definitive management steps for breast schwannomas currently.

Due to the rare transformation potential of schwannomas into MPNST, surgical excision is the treatment of choice [2, 18, 23]. Following successful excision of the mass, prognosis is good with rare recurrence if removed in its entirety [2, 3]. Discussion remains whether surgical excision is necessary in patients with little to no growth of the lesions presenting without other symptoms. While cases have been cited of other

Table 2: Reports of breast schwannoma in English literature between 2014 and 2024

Author, pub year	Age	Sex	Symptom	Duration	Size	Core biopsy	BIRADS	Treatment	Recurrence
Xi X, 2023	37	F	Painless mass	>2 months	2.3 cm	N	4b	SE	N
Kang YJ, 2024	32	F	Painful mass	6 years	2.2 cm	NR	3	SE	NR
Yadav K, 2022	60	M	Painful mass	8 years	3.2 cm	NR	4b	SE	N (6 m FU)
Lee H, 2021	60	F	Painful mass	NR	1.0 cm	Y	4a	SE	N (1 y FU)
Duehrkoop M, 2021	79	F	Painless lump	"Few weeks"	13 mm	Y	4	SE	NR
Gorji L, 2021	37	F	Painless mass	NR	1.5 cm	Y	4	SE	NR
Araujo JLA, 2020	14		NR	2 months	1.8 cm	NR	NR	SE	N (5 y FU)
Ravelomihary T, 2019	38	F	Painless mass		25 cm	Y	NR	Mast	N (1 y FU)
Zhang Y, 2018	28	F	NR	4 years	58 mm	NR	NR	SE	N (6 m FU)
Halteh P, 2017	38	F	Palpable mass		0.8 cm	Y	NR	SE	NR
Parikh Y, 2016	48	F	Palpable mass	2 weeks	1.6 cm	Y	4a	SE	NR
Hamdy O, 2019	79	F	Palpable mass	1 week	10 mm	N	NR	SE	NR
Our case, 2024	42	F	Palpable mass	5 years	10 mm	Y	4b	SE	N

Abbreviations: F: Female, M: Male, N: No, NR: Not reported, Y: Yes, SE: Surgical excision, Mast: Mastectomy.
Reports of breast schwannoma in the English literature between 2014 and 2024, including our case. Twenty-nine cases were reported in the English literature prior to 2014 [8].

schwannomas transforming into MPNST, such instances are rare and have not been reported for benign breast schwannomas [24].

Halteh et al. argue that it is reasonable to follow patients through imaging only if the lesions lack growth and presents with good radiologic-pathologic correlation [4]. Similarly, Ashoor et al. propose potential non-surgical alternatives to biopsy for histological and surveillance purposes—such as vacuum-assisted excision and biopsy—but acknowledge current data to be insufficient to yet justify such alternatives [18]. Observation with serial imaging may be offered for patients with possibility of long-term follow-up, as with our patient. If the tumor remains stable and lacks symptoms, it may be reasonable to allow patients choice between surgical excision and routine screening mammograms following 2-year follow-up. Our case is unique in that we were able to follow this patient for over six years. Although the lesion progressively, slightly enlarged overtime, surgical pathology remained benign. With careful radiologic-pathologic concordance, observation is a reasonable alternative to surgical excision.

CONCLUSION

Our report supports that breast schwannoma is rare, benign, and slow growing. While rare, schwannomas must remain a differential diagnosis in routine mammography. Considering the challenges of morphologically differentiating schwannomas from malignant tumors, we recommend diagnoses through biopsy and histopathology. Surgical excision remains the treatment of choice for benign schwannomas and other BI-RADS 4 lesions. Long-term observation or minimally invasive procedures, such as vacuum-assisted biopsy, should be considered as alternatives to surgical excision given its benign nature.

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Author Contributions

Haneul Ryou – Conception of the work, Design of the work, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, 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

Hongxiu Ji – Conception of the work, Design of the work, Drafting the work, Final approval of the version to be published, 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

April Phantana-angkool – Conception of the work, Design of the work, Acquisition of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, 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

Guarantor of Submission

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Written informed consent was obtained from the patient for publication of this article.

Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.