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Authors

Rahmani, Liora
Lieberman, Miriam R
Groysman, Tatyana
et al.

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Case Report

Atypical presentation of axillary web syndrome following punch biopsy: case report and literature review

Liora Rahmani, BA^{1,2}, Miriam R Lieberman, MD^{1a}, Tatyana Groysman, DO^{1,3}, Meryl Rosen, MD⁴

¹ NSS Dermatology PLLC, New York, New York, United States, ² Stern College for Women, Yeshiva University, New York, New York, United States, ³ The Mount Sinai Hospital, New York, New York, United States, ⁴ Ackerman Academy of Dermatopathology, New York, New York, United States

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Abstract

Axillary web syndrome, or cording, presents as fibrotic bands that develop beneath the skin, causing pain and restricted shoulder movement. Axillary web syndrome typically arises as a complication following axillary surgery for breast cancer. We present a unique case of a 38-year-old woman with no history of malignancy, breast surgery, or trauma, who developed AWS following a punch biopsy after initially presenting with a subcutaneous nodule in the right axilla. This case highlights the need for increased exploration of the pathogenesis of axillary web syndrome, suggesting a potentially higher incidence of axillary web syndrome than currently reported owing to its self-limiting nature. In addition, the case demonstrates the importance of dermatological awareness of this condition, as its presentation is not limited to breast cancer patients who have undergone major axillary and breast procedures.

Introduction

Axillary web syndrome (AWS) is a condition which involves the development of visible linear bands of firm tissue, commonly referred to as cords, in the axilla and arm. AWS is often associated with pain and a limited range of motion in the shoulder and arm. AWS is most commonly reported in breast cancer patients who have undergone axillary lymph node surgery, although the exact etiology of the disease is unclear.¹ AWS is thought to be self-limiting and usually resolves within two to three months.² Herein, we present a woman who developed AWS following a punch biopsy and in the absence of prior breast surgery or major axillary procedures related to breast cancer prior to presentation. The presentation of AWS in

this woman is unique, as it is the first reported case of AWS in an individual following a punch biopsy. It suggests the importance of dermatologists' awareness of this potential complication when performing procedures in the axillary region.

Case Synopsis

A 38-year-old woman first came to the dermatology clinic for a subcutaneous nodule in her right axilla that had been present for one week. The patient denied any constitutional symptoms, history of known malignancy, breast surgery, or trauma to the affected area. The patient reported that she began taking oral cephalexin prior to visiting the clinic, which she reported caused the lesion to decrease in size. On physical exam, the patient had a 3cm semifluctuant subcutaneous nodule at the inferior aspect of the right axilla. A 3mm punch tool was used to incise into the nodule, but drainage was minimal and 0.1ml of triamcinolone acetone injectable suspension 10mg/ml was injected into the mass. Mupirocin 2% ointment was prescribed to be applied three times a day. Histopathology of the biopsy specimen showed an inflammatory cell infiltrate of neutrophils, lymphocytes, and histiocytes in the dermis around what appears to be follicular epithelium and degenerated collagen, consistent with a diagnosis of suppurative dermatitis (**Figure 1A-D**). An aerobic bacterial culture reported no growth within 36 through 48 hours.

One week later, the patient returned to the clinic, complaining of pain when raising her arm and an unusual appearance of the skin. The skin showed a healing inflammatory biopsy site with a firm rope-like plaque along the axilla; no lymphadenopathy was identified (**Figure 2**). Given the history and physical exam, AWS was suspected. Ultrasound of the right axilla showed no signs of clots or phlebitis. The patient was advised to monitor her symptoms and apply comfort measures, such as resting her

a Corresponding Author: Miriam R Lieberman, 150 West 55th Street Suite 1G, New York, NY 10019, Tel: 212-991-6490, Email: miriamrlieberman@gmail.com

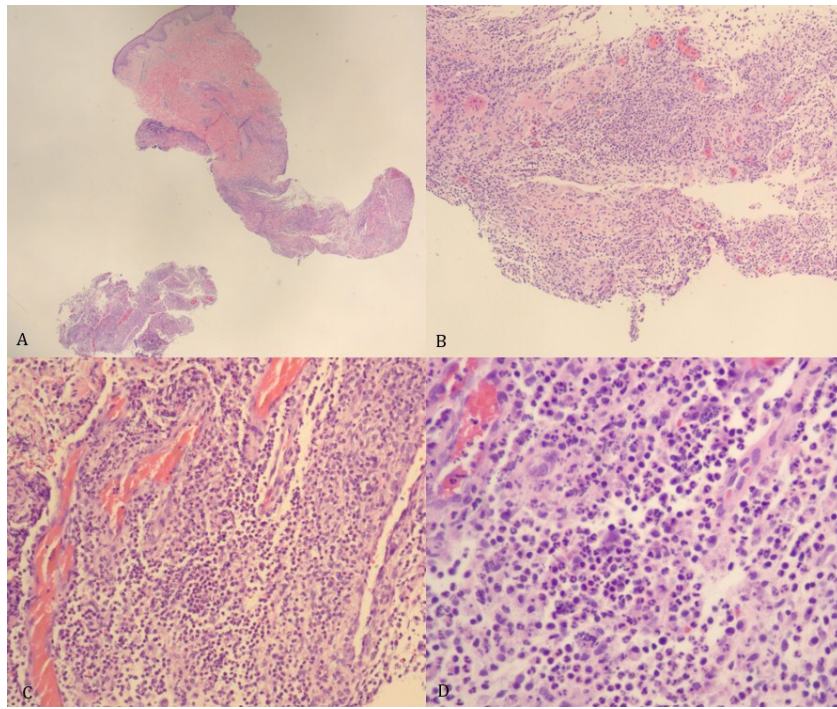


Figure 1. Hematoxylin and eosin. Histopathological images of lesion on patient's axilla. **A)** Deep dermal infiltrate that extends into the subcutis, 40X. **B)** Predominantly neutrophilic infiltrate containing occasional histiocytes, 100X. **C)** Infiltrate is composed primary of neutrophils, with occasional histiocytes, 200X. **D)** Close-up view of the cells that comprise the infiltrate. Since the infiltrate is predominantly neutrophilic, it is classified as a suppurative dermatitis, 400X.



Figure 2. Presentation of suspected axillary web syndrome with visible cord.

arm, applying warm compresses, and using non-steroidal anti-inflammatory drugs (NSAIDs).

The patient returned to the clinic two weeks later reporting a decrease in pain. She reported improvement of her condition with rest and warm compresses. The axilla

was clear of erythema and swelling. The patient was advised to continue monitoring her condition.

Case Discussion

Axillary web syndrome, also known as cording, refers to the development of a fibrotic band or rope/cord-like structure beneath the skin, in the subcutaneous tissue in the axilla.³ AWS is characterized by a visible web of taut tissue and is associated with a limited range of motion in the shoulder owing to tension, often accompanied by pain.⁴ Axillary web syndrome usually presents as a complication in patients shortly after breast surgery, especially after axillary lymphadenectomy treatments.⁵ Although the exact pathogenesis remains unclear, AWS is thought to occur because of trauma affecting the connective tissue encasing blood vessels, lymph vessels, and nerves,⁶ leading to the interruption of the axillary lymphatic system.⁷ This results in inflammation, scarring, and hardening of the connective tissue, which can result in cord formation.⁶

The presentation of AWS in this individual is unique, as it was not associated with prior procedures involving the breasts or axillae. Studies have found that survivors of breast cancer who have undergone breast reconstruction are 86% more susceptible to AWS.² Thus, the patient's display of AWS is unique and must be studied.

As AWS is rare, a review of the literature was performed to better clarify its typical presentation. All English articles (n=26) describing AWS cases in the PubMed database as of October 2024 were considered. From

these 26 reports, 32 individual cases of AWS were described ([Table 1](#)). Of these 32 cases, 18 were related to surgical procedures for breast cancer,^{2,8-18} whereas 14 arose in the absence of such procedures.^{3,7,19-30} Of these 14 cases, four were reported following intense physical exertion¹⁹⁻²¹ or trauma²² and three were thought to be idiopathic with no known cause.^{3,23,24} Additionally, one case presented in an individual with a history of mycosis fungoides who underwent axillary lymph node biopsy⁷; one case presented in an individual with a history of melanoma who underwent axillary sentinel node biopsy²⁵; one case was thought to be caused by chemotherapy treatment in an individual who presented with a history of non-Hodgkin lymphoma and lymphedema²⁶; and one case was reportedly caused by venous blood sampling.²⁷ Three reported cases were associated with a nodule in the axillary region.²⁸⁻³⁰ Of these three cases, AWS arose in one case after excision of a ruptured axillary epidermal cyst,²⁸ whereas in the other two cases, the individuals presented with cording in the axilla accompanied by a history of nodules or furuncles in the axilla, with no axillary procedure performed prior to presentation.^{29,30} To our knowledge, this is the first reported case of AWS after a punch biopsy in the axilla of an individual who had not undergone breast or axillary surgery related to breast cancer. Therefore, it is important to draw the attention of dermatologists to this underrecognized complication of biopsies and other procedures in the axillary region.

It is important to distinguish the cord-like structure that characterizes AWS from other conditions involving similar presentations. Other conditions in the differential diagnosis of AWS include reactive granulomatous dermatitis, lymphangitis, and Mondor disease ([Table 2](#)). Although the differential diagnoses were considered, based on physical examination, clinical history, and findings, our patient was diagnosed with AWS.

Reactive granulomatous dermatitis (previously referred to as interstitial granulomatous dermatitis) is a rare dermatologic condition that presents as annular erythematous to violaceous papules or plaques, which are generally located on the lateral aspect of the trunk and proximal limbs.³⁵ Reactive granulomatous dermatitis is rare, with only 216 cases published in English literature.³² In certain cases, reactive granulomatous dermatitis presents as a rope sign, with linear subcutaneous erythematous or skin-colored cords extending through the lateral torso.³⁵ The presence of the rope sign has only been described in less than 10% of cases of reactive granulomatous dermatitis.⁴⁸ Histologically, reactive granulomatous dermatitis is characterized by a band-like infiltrate of histiocytes and lymphocytes (floating sign) in the reticular dermis, scarce neutrophils and eosinophils with focal areas of bundles palisading around necrotic collagen, absent leukocytoclastic vasculitis, and minimal or absent mucin deposition.^{41,42} Although the pathophysiology of the condition is not completely understood, it is most often associated with underlying autoimmune disorders, particularly rheumatoid arthritis and lupus.³²

Treatment options include topical or systemic corticosteroids, dapsone, and NSAIDs.^{41,46} Although the rope sign of reactive granulomatous dermatitis resembles the cord-like lesions characteristic of AWS, it was ruled out owing to the absence of a history of autoimmune or other systemic disorders, lack of visible erythema, and the short clinical course.

Lymphangitis is another condition in the differential diagnosis of AWS. Lymphangitis is the inflammation of lymphatic channels secondary to infection, most often caused by acute bacterial infections and less often secondary to non-bacterial agents such as viral, fungal, and parasitic infections.³⁶ Lymphangitis presents as linear erythematous streaks extending proximally towards draining lymph nodes, sometimes featuring comet tail signs.³⁶ Histologically, lymphangitis is characterized by a superficial and deep mixed inflammatory infiltrate, with numerous eosinophils and scattered mastocytes predominantly around dermal vessels, hair follicles, and sebaceous glands. A moderate inflammatory infiltrate in the dermis with slight spongiosis is also characteristic.⁴³ Superficial lymphangitis is generally self-limiting, whereas infective (bacterial, fungal, or parasitic) lymphangitis resolves with treatment of the underlying infection present.³⁶ Severe cases are often treated with topical or systemic corticosteroids, antibiotics or NSAIDs.^{36,47} Although lymphangitis was considered, it was ruled out based on the ultrasound imaging and the absence of infectious etiology or lymphadenopathy upon physical examination.

Mondor disease, a condition which involves thrombophlebitis of superficial veins of the breast and anterior chest wall,⁴⁹ is also in the differential diagnosis of AWS. Mondor disease is rare, with less than 400 reported cases.³⁴ AWS has sometimes been described as a variant of Mondor disease based on their similar clinical presentation, but other authors conclude that they are not the same entity, as AWS is not associated with superficial vein thrombosis.^{1,50} Clinically, Mondor disease presents as palpable cord-like plaques on the body surface.³⁷ Although Mondor disease generally affects the veins of the breast and anterior chest wall, it can also affect other venous systems including the axilla, groin, and penis.³⁸ Histologically, Mondor disease is characterized by prominent vessels with plump endothelial cells, an inflammatory infiltrate, and connective tissue proliferation in the vessel wall (thrombophlebitis of the superficial vein).^{44,45} Mondor disease is most commonly associated with breast cancer, vasculitis, and hypercoagulable conditions.³⁴ Mondor disease is generally self-limiting but is often treated with warm compresses or NSAIDs.³⁴ Mondor disease was ruled out based on the ultrasound findings and the absence of a thrombosed superficial vein in the axilla.

Conclusion

AWS is characterized by the formation of fibrotic bands beneath the skin in the axillary region, commonly oc-

Table 1. Literature Review of Cases of Axillary Web Syndrome

Case	Patient [Age, Gender]	Preexisting Disease	Triggering Event for axillary web syndrome
Our patient	38, F	None	Punch biopsy of a lesion in axilla
Aydogan, et al ²	43, F	Breast cancer	Sentinel lymph node biopsy
Johansson, et al ⁸	Seven patients (Six F ages 28 through 54, one 76-year-old M)	Breast cancer	Axillary node surgery
de Sire, et al ⁹	66, F	Breast cancer	Quadrantectomy
Jacob, et al ¹⁰	65, F	Breast cancer	Lumpectomy
Crane, et al ¹¹	48, F	Breast cancer	Mastectomy and lymph node dissection
Thompson Buum, et al ¹²	44, F	Breast cancer	Mastectomy and sentinel lymph node biopsy
Nieves Maldonado, et al ¹³	49, F	Breast cancer	Mastectomy and sentinel lymph node biopsy
Wei, et al ¹⁴	39, F	Breast cancer	Breast-conserving surgery and axillary lymph node biopsy
Fourie, et al ¹⁵	47, F	Breast cancer	Mastectomy and axillary dissection
Craythorne, et al ¹⁶	26, F	Breast cancer	Local excision of carcinoma in axilla
Reedijk, et al ¹⁷	41, F	Breast cancer	Lumpectomy and axillary lymph node dissection
Tilley, et al ¹⁸	37, F	Breast cancer	Lumpectomy, sentinel lymph node biopsy, and axillary dissection
Alharazy ¹⁹	38, M	None	Excessive physical exertion
Hunt, et al ²⁰	43, M	None	Excessive physical exertion
Welsh, et al ²¹	38, M	None	Excessive physical exertion
Mohammed, et al ²²	63, M	None	Trauma
Siddiqui, et al ³	73, F	None	Idiopathic
Demir, et al ²³	40, M	None	Idiopathic
Marya, et al ²⁴	24, F	None	Idiopathic
Mizuno, et al ⁷	63, M	Mycosis fungoides	Axillary lymph node biopsy
Clarke, et al ²⁵	54, M	Melanoma	Sentinel lymph node biopsy
Rubiño, et al ²⁶	66, M	Lymphoedema and non-Hodgkin lymphoma	Chemotherapy treatment
Kitajima, et al ²⁷	31, M	None	Venous blood sampling
Lim, et al ²⁸	30, M	None	Excision of epidermal cyst in axilla

Case	Patient [Age, Gender]	Preexisting Disease	Triggering Event for axillary web syndrome
Lee, et al ²⁹	63, M	None	Nodule in axilla
Rashtak, et al ³⁰	57, M	None	Furuncle in axilla

currence as a complication following axillary surgery for breast cancer. The unique presentation of AWS in this individual, as a sequela of a skin punch biopsy, highlights the importance of dermatologists considering the potential provocation of AWS when performing procedures in the axillary region. Additionally, they should remain mindful of other conditions in the differential diagnosis for cord-like bands, such as reactive granulomatous dermatitis, lymphangitis, and Mondor disease. Furthermore, as AWS is generally considered self-limiting and typically resolves without treatment, its incidence is likely underreported and the mechanism underlying AWS warrants further investigation.

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Potential conflicts of interest

The authors declare no conflicts of interest.

Table 2. Comparison of Features of Axillary Web Syndrome, Reactive Granulomatous Dermatitis, Lymphangitis, and Mondor Disease

Condition	Axillary web syndrome	Reactive granulomatous dermatitis	Lymphangitis	Mondor disease
Epidemiology	Prevalence of approximately 30% after breast cancer surgery ³¹	Rare, with approximately 200 cases reported ³²	Incidence varies based on infection and predisposing conditions ³³	Rare, with less than 400 cases reported ³⁴
Clinical Presentation	Firm, linear, subcutaneous fibrotic bands or cords of taut tissue ⁷	Annular erythematous to violaceous papules or plaques, with the rope sign appearing as linear subcutaneous erythematous or skin-colored cords ³⁵	Linear erythematous streaks extending toward draining lymph nodes, sometimes giving comet tail signs ³⁶	Palpable subcutaneous cord-like lesion ³⁷
Location of Lesions	Axilla ¹	Lateral aspect of the trunk and proximal limbs, with the rope sign extending through the lateral torso on the trunk and flanks ³⁵	Extends proximally toward regional lymph nodes ³⁶	Breast or anterior chest wall, but can also affect other venous systems including axilla, groin, and penis ^{34,38}
Pathology	Dilated lymphatic vessels with occasional fibrin clots and venous thrombosis at various stages of recanalization ^{39, 40}	Band-like infiltrate of histiocytes and lymphocytes (floating sign) in the reticular dermis, scarce neutrophils and eosinophils with focal areas of bundles palisading around necrotic collagen, absent leukocytoclastic vasculitis and minimal or absent mucin deposition ^{41,42}	Superficial and deep mixed inflammatory infiltrate, with numerous eosinophils and scattered mastocytes predominant around dermal vessels, hair follicles and sebaceous glands, and moderate inflammatory infiltrate in dermis with slight spongiosis ⁴³	Prominent vessels with plump endothelial cells, an inflammatory infiltrate, and connective tissue proliferation in the vessel wall (thrombophlebitis of the superficial vein) ^{44,45}
Associated Disease	Breast cancer ¹	Autoimmune disorders, particularly rheumatoid arthritis and lupus ³²	Most commonly caused by infection ³⁶	Breast cancer, vasculitis, and hypercoagulable conditions ³⁴
Treatment	Generally self-limiting, with described treatments in literature including physical therapy and NSAIDs ²	Topical or systemic corticosteroids, dapsone, and NSAIDs ^{41,46}	Superficial lymphangitis is generally self-limiting, while infective lymphangitis is resolved with treatment of the underlying infection present; severe cases often treated with topical or systemic steroids, antibiotics or NSAIDs ^{36,47}	Generally self-limiting, but often treated with warm compresses or NSAIDs ³⁴

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