Journal of Cytology and Histopathology Research
Volume 5 | Issue 1
2348-9790

Case Report Open Access

Branchioma: First Case Report from Oman and Review of Literature

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Citation: Hunaina Al Kindi, Mina George, Khalifa Al Jabari, Humaid Al Riyami, Verna Menon et al. (2026) Branchioma: First Case Report from Oman and Review of Literature. J Cytol Histopathol Res 5(1):101.

Received Date: June 07, 2026 **Accepted Date:** June 15, 2026 **Published Date:** June 22, 2026

Abstract

Previously known as ectopic hamartomatous thymoma, thymic anlage tumor, and branchial anlage tumor, branchioma is an exceedingly rare neoplasm that frequently originates in the lower anterior neck of adult males. To date, only 85 cases have been reported in the English literature. Herein we present the first case of branchioma from Oman, occurring in a 46-year-old male who presented with a left supraclavicular mass. The diagnosis was determined through histological confirmation of the characteristic admixture of epithelial formations, spindle cells, and fatty tissue. Immunohistochemistry was positive for pan-cytokeratin AE1/AE3 and cytokeratin 19 (CK19) in the epithelial component, as well as cluster of differentiation (CD)34 in the spindle cells.

Keywords: Branchioma; Hamartoma; Thymoma; Male; Head and Neck Neoplasms; Immunohistochemistry

Introduction

A branchioma is a rare type of tumor characterized by a mixed proliferation of epithelial components, spindle cells, and varying amounts of adipose tissue [1]. A head and neck tumor, it develops usually in the anterior lower neck, most frequently in the suprasternal or supraclavicular region. This lesion was previously known under several different names, most notably ectopic hamartomatous thymoma; however, as a result of its presumed origin from the branchial apparatus derivatives, the term 'branchioma' has been adopted in recent classifications [1,2]. Branchiomas have been reported in patients of various different ages, but tend to be most common in adults, with a slight male preponderance [3-5].

Clinically, patients with branchiomas usually present with a slow growing, painless subcutaneous mass in the lower neck, usually on the left side [1,3,5]. Imaging will typically show a clearly defined mass in the soft tissue; however, confirmation of the diagnosis is contingent upon histopathological examination [1,6]. Histologically, branchiomas exhibit a distinct pattern involving a mixed proliferation of two or three cellular elements, predominantly epithelial clusters, spindle-shaped cells, and adipose tissue in varying proportions [1]. This report discusses the first case of branchioma reported from Oman, focusing on the clinicopathologic characteristics, relevant differential diagnoses, and a review of the existing literature.

Case Presentation

A 46-year-old man presented to our institution with a slow-growing mass on the left side of his chest around the sternoclavicular joint. The patient reported having been aware of the mass for several years prior to seeking medical help, during which time it had gradually increased in size. There was no record indicative of any relevant previous trauma, pain, or other symptoms. A physical examination of the patient confirmed the presence of a localized subcutaneous mass in the left sternoclavicular area.

Ultrasonography showed a 39 × 23-mm oval-shaped, well-circumscribed mass in the left sternoclavicular region. It was a heterogeneous, predominantly hyperechoic lesion containing small hypoechoic and anechoic foci with a 4-mm area of calcification (Figure 1). There were no signs of internal vascularity or surrounding edema. The bones underneath appeared normal. Based on these radiological impressions, the initial differential diagnosis included fibrolipoma, liposarcoma, and neurofibroma.

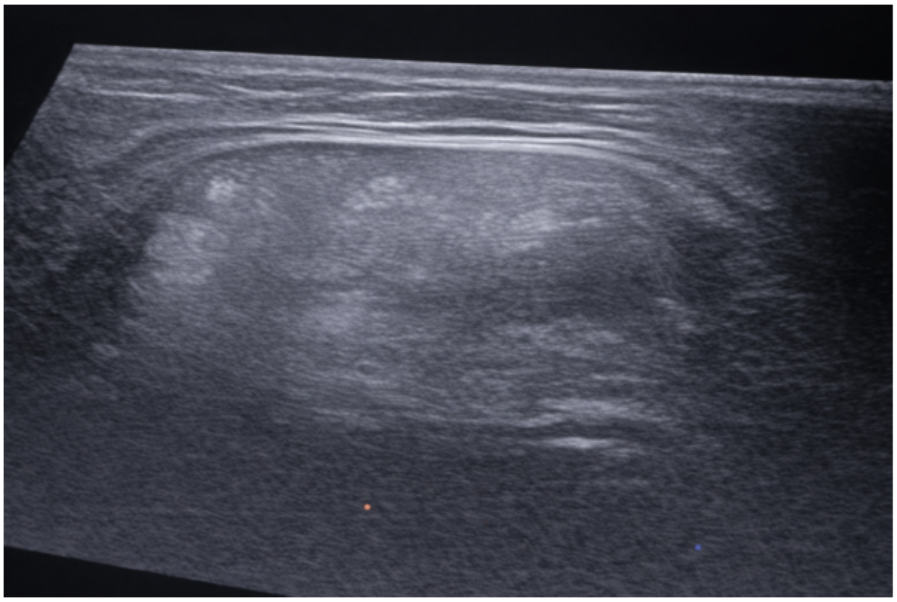

Figure 1: Ultrasonography of the left sternoclavicular region of a 46-year-old man showing a well-circumscribed heterogenous mass with a few smaller hypoechoic and anechoic areas.

Subsequent magnetic resonance imaging revealed a soft tissue mass measuring approximately 25 × 22 × 15 mm. On T1-weighted images, the lesion was isointense to muscle, with outer curved regions displaying fat-like signals. It appeared heterogeneously hyperintense on T2-weighted and short-TI inversion recovery sequences (Figure 2a), with some moderate heterogeneous enhancement observed after administering gadolinium (Figure 2b). The mass was abutting the left sternoclavicular muscle, while the surrounding fat planes were not involved. These findings were indicative of a soft tissue neoplasm.

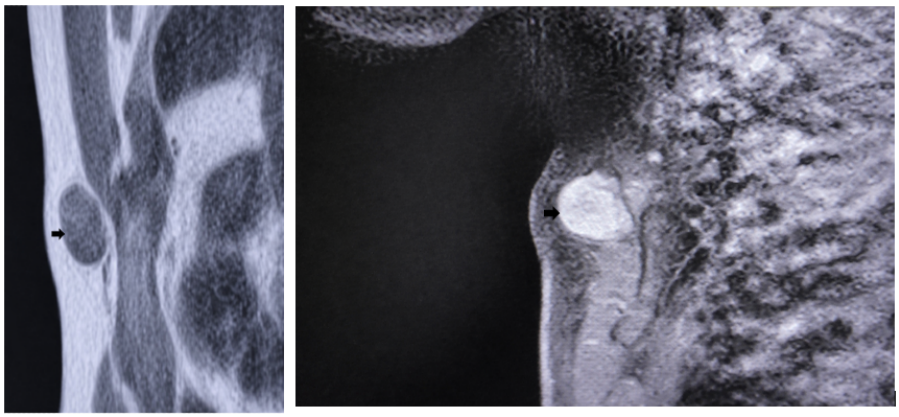

Figure 2a Figure 2b

Figure 2: Magnetic resonance imaging of the lesional area in the left sternoclavicular region of a 46-year-old man showing (a) isointensity on T1-weighted images (arrow) and (b) hyperintensity on T2-weighted images (arrow).

The patient underwent surgical excision of the mass, resulting in the removal of three separate pieces of fatty tissue. Upon gross examination, one specimen was nodular, partially encapsulated, and measured 45 × 40 × 25 mm. A cut section revealed a dark yellow appearance with whitish areas dispersed throughout and hemorrhagic foci. The other two fatty tissue fragments together measured 70 × 55 × 20 mm. Microscopic examination revealed a well-circumscribed neoplasm with a haphazard mixture of adipocytes, epithelial cells, and spindle cells. The epithelial cells appeared as compressed cords, tubules, glandular structures, and squamoid islands with a focal syringomatous pattern, while the spindle cells were arranged in fascicles in a storiform pattern, insinuating into the adipocytic component and glandular elements (Figure 3a to 3d). There was no evidence of increased mitotic activity, significant atypical, or necrosis.

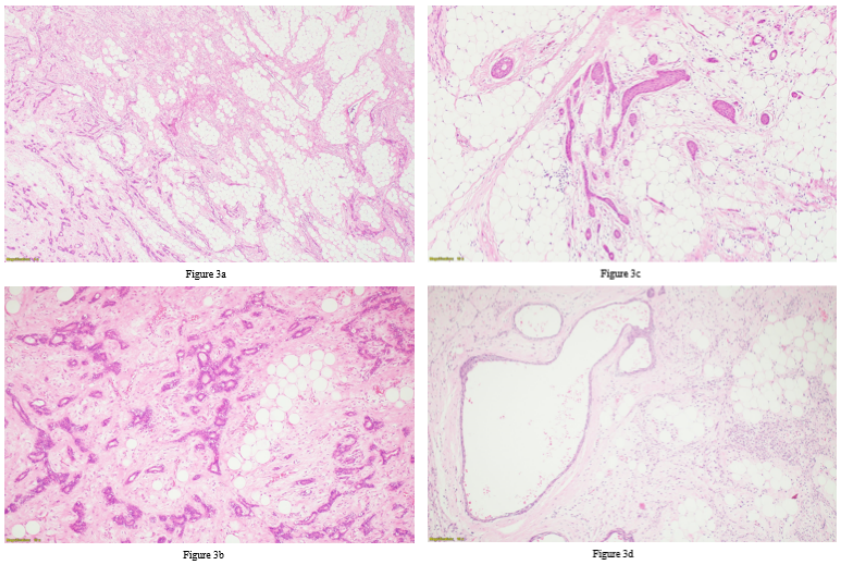

Figure 3a Figure 3c

Figure 3b Figure 3d

Figure 3: Hematoxylin and eosin stains of the excised lesion showing (a) an admixture of spindle cells, epithelial nests, and adipose cells (at x40 magnification), (b) a mixed glandular structure, spindle cells, and adipose tissue (at x100 magnification), (c) nonkeratinizing squamous cell nests (at x100 magnification), and (d) variable-sized cysts forming the epithelial component of the lesion (at x100 magnification).

An immunohistochemical panel indicated that the spindle cells were positive for cluster of differentiation (CD)34 and focally positive for smooth muscle actin (SMA), while the epithelial islands were positive for pan-cytokeratin AE1/AE3 and cytokeratin 19 (CK19) (Figures 4a to 4d). Conversely, the cells were negative for progesterone receptor and desmin. Sections from the two smaller masses revealed unremarkable adipose tissue. Altogether, the clinical presentation of the patient and radiological and histological findings of the case were deemed characteristic of a branchioma.

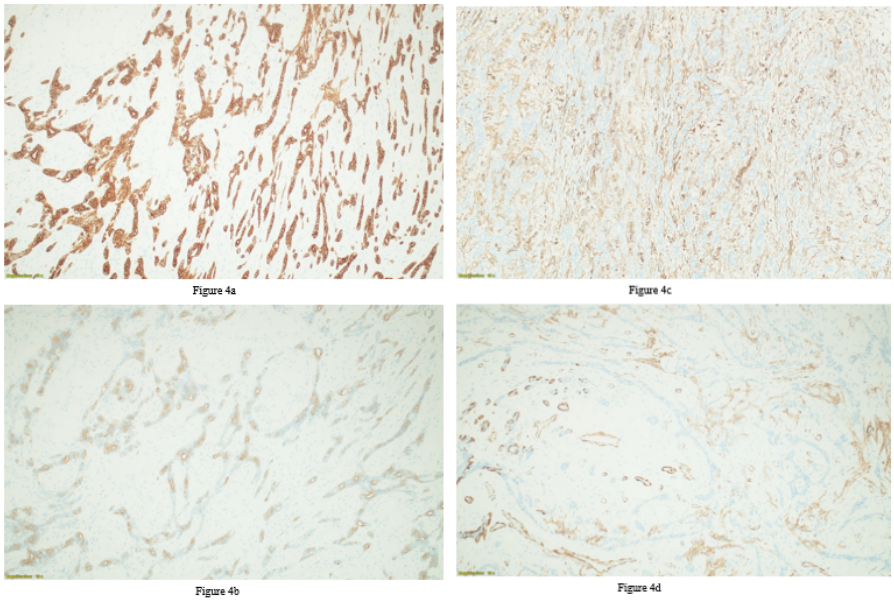

Figure 4: Immunohistochemical panel for the excised lesion showing (a) epithelial nests positive for pan-cytokeratin AE1/AE3, (b) epithelial cells positive for cytokeratin 19 (CK19), (c) spindle-shaped cells positive for cluster of differentiation (CD)34, and (d) spindle cells focally positive for smooth muscle actin (SMA).

Discussion

Branchioma was first described by Smith and McClure in 1982 as an "unusual mixed tumour featuring mesenchymal and epithelial components" (p. 1074) [7]. Subsequently, Rosai et al [8], designated the entity as ectopic hamartomatous thymoma in 1984. Later, this neoplasm was renamed branchial anlage tumor for its presumed origin from the branchial apparatus [3,9]. In 2018, Sato et al [4], proposed the name biphenotypic branchioma to reflect the tumor's unique dual embryonic origin [4]. Currently, as per the World Health Organization's most recent classifications of head and neck tumors, nomenclature has been standardized under the term branchioma, as this name emphasizes the tumor's likely origin from leftover remnants of the branchial apparatus [1].

Since its first description in 1982, few cases of branchioma have been documented in the literature, suggesting that this lesion constitutes a relatively rare entity [2-12]. Clinically, branchiomas usually present as slow-growing, painless masses located in the lower neck or supraclavicular region. These lesions are usually well-circumscribed and may remain asymptomatic for years [5,10]. Differential diagnosis includes various types of neck lesions, such as salivary gland tumors or ectopic thymic lesions, which also contain a mixture of adipose, spindle, and epithelial cells. Unfortunately, imaging is often unable to differentiate between branchioma and other types of soft tissue neck tumors. As such, histopathological examination is needed to ensure an accurate diagnosis and avoid the aggressive therapy reserved for more malignant entities.

Histologically, branchioma is diagnosed by the presence of a mixed proliferation of varying amounts of epithelial elements, spindle cells, and adipocytes [2-12]. The epithelial portion tends to consist of clusters of epithelial cells, anastomosing cords, glandular formations, squamoid islands or cystic formations, and is usually associated with myoepithelial cells. The spindle

cells are usually bland and arranged in storiform patterns, fascicles, or lattice-like growths, often infiltrating and merging with the epithelial component [2,6]. Adipocytes tend to be scattered haphazardly throughout. On immunohistochemistry, the epithelial component is usually positive for cytokeratins like CK5/6 and may also exhibit p63 or p40, indicating squamous or basal cell differentiation. The spindle cells typically exhibit myoepithelial characteristics by expressing positivity for SMA. Some cases also display CD34 positivity in the stromal component [2,13]. Such findings support the tumor's biphenotypic nature.

To date, little is known regarding the molecular genetic background of this rare entity. Thompson et al [14], identified a hotspot HRAS mutation (p.Gln61Lys) in a 70-year-old female with branchioma, confirming the lesion's neoplastic nature and supporting the change in nomenclature [14]. Similarly, Baněčková et al [15], described a case in a 78-year-old man with a complex nested/organoid morphological appearance [15]. Importantly, these authors provided the first report of the characteristic absence of retinoblastoma 1 (RB1) immunoexpression in this type of tumor, while next generation sequencing also identified various mutations in the *KRAS, MSH6*, and *PTEN* genes [15]. Bradová et al [16], conducted an immunohistochemical and molecular genetic analysis of 23 cases of branchioma; they identified a lack of RB1 protein expression in the majority (n = 16 cases), while an *RB1* gene deletion was identified in two cases *via* fluorescence *in situ* hybridization [16]. Unfortunately, molecular analyses could not be performed in the present case.

Although branchiomas are typically considered benign, rare cases of malignant transformation involving the epithelial component have been reported [1,16,17]. However, in most cases, total surgical removal is effectively curative and recurrence is rare. As a result, the patient's long-term prognosis is very good, with no instances of associated mortality reported in the literature [1].

Conclusion

In summary, the present paper describes a case of branchioma occurring in a 46-year-old male with a left supraclavicular mass, consistent with the characteristic clinical presentation detailed previously in the literature [5,10]. The histological examination also revealed a typical distinct mixture of epithelial formations, spindle cells, and fatty tissue, thus confirming the diagnosis. Pathologists and clinicians should keep this rare entity in mind when faced with patients with soft tissue neck lesions to ensure accurate diagnosis and effective management.

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