



## Case report

## Vulvar glomangioma: A case report and literature review

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## ABSTRACT

GLMN is a gene that encodes a critical protein necessary for normal vascular development. Mutations of GLMN predispose individuals to development of glomangiomas, with nearly 100% penetrance by age 30. Glomangiomas are tumors of the glomus body, a thermoregulatory arterial-venous shunt composed of modified smooth muscle cells. Vulvar glomangioma is an exceedingly rare cause of chronic pelvic pain, that may be easily confused for other conditions such as Bartholin's gland abscess or deep angiomyomas, thereby delaying diagnosis and treatment. Glomangiomas have characteristic pathologic and imaging findings which may aid diagnosis. We herein describe the case of a 24-year-old female who developed chronic pelvic pain in the setting of a vulvar glomangioma. We further delineate the magnetic resonance imaging and biopsy findings critical to her diagnosis, and the appropriate steps taken for surgical management. She was found to harbor a heterozygous GLMN mutation. To the best of our knowledge, this is the first description of such a case in the medical literature.

## 1. Introduction

Vulvar pain presenting in young women can be due to a variety of causes including Bartholin cysts, inflammatory conditions such as vulvovaginitis, endometriosis, malignant neoplasms including squamous cell carcinoma, and idiopathic conditions like vulvodynia. Characterization and localization of pain and its association with a lesion can help elucidate the underlying pathology. For example, cyclic pain may indicate a menstrual associated condition, whereas pain during sexual intercourse with a fluctuant mass near the vaginal introitus is more likely to be a Bartholin cyst abscess. Magnetic resonance imaging (MRI) utilization in unclear situations can further help in differentiating between conditions accounting for pelvic pain, primarily by detection of mass lesions. Multiplanar acquisition can demonstrate relationship of the mass lesions to important structures such as urethra, urinary bladder, and rectum for surgical planning.

Vaginal neoplasms are uncommon, and benign lesions are rare. Neoplasms that develop in the genitourinary tract may also occur in the vagina. Solid neoplasms that can occur in vagina include leiomyoma, fibroepithelial polyps, carcinoma, melanoma, and sarcomas. Although

primary malignancies in the vagina are rare (Alkatout, 2015), identification is critical to prevent spread and reduce morbidity and mortality. In this case report, we describe an exceedingly rare case of glomangioma of the vulva in a patient with an underlying GLMN mutation, and describe the management and outcome.

## 2. Case report

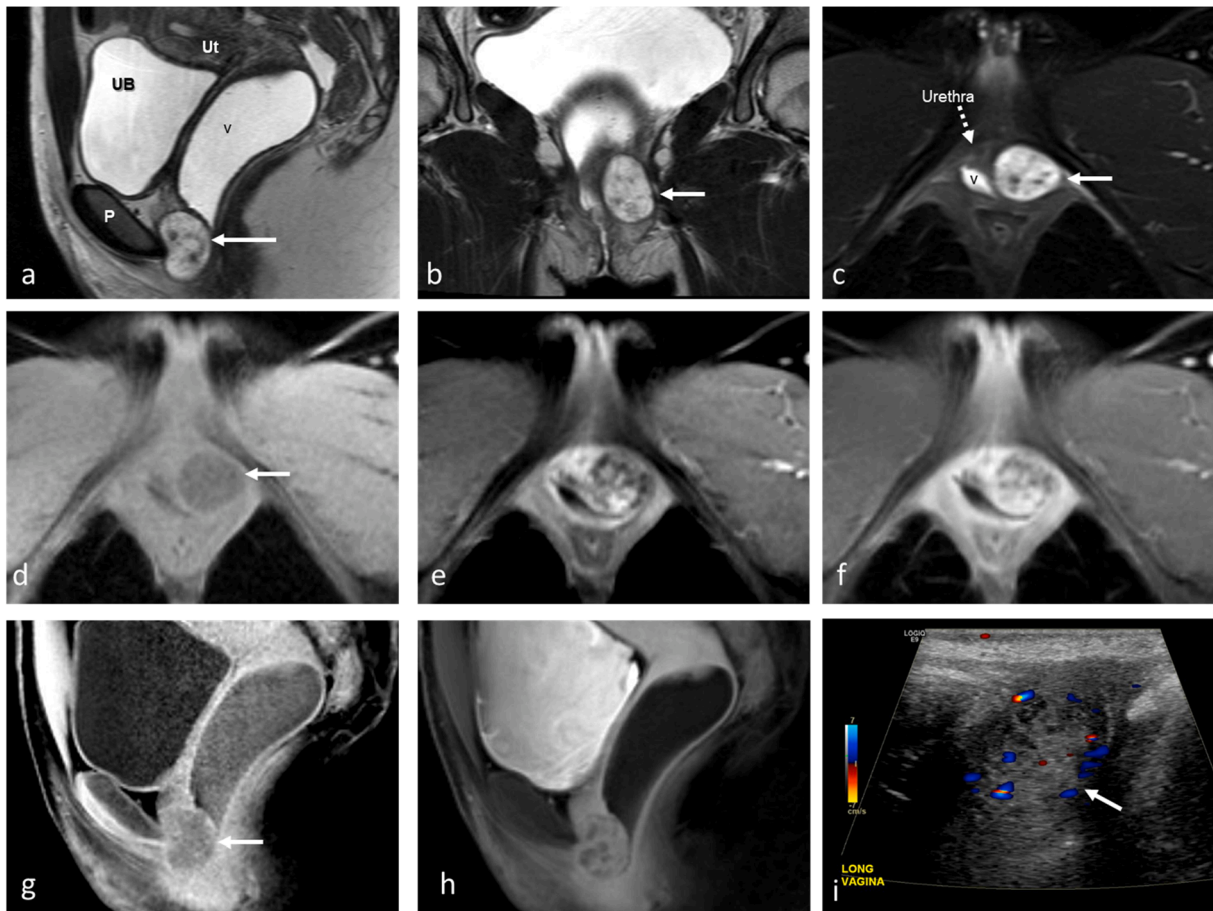
The patient was a 24-year-old female without prior pregnancies who began experiencing discomfort with intercourse for two and a half years prior to presentation to gynecologic oncology. Over the course of 1.5 years, the discomfort progressed to sharp, shooting electric-shock-like pain with intercourse or tampon use. The patient was treated for bacterial vaginosis and a yeast infection but her pain persisted. Imaging with a pelvic ultrasound revealed no abnormalities. The patient was started on a gabapentin compounded cream for pain control and subsequently referred to pelvic floor physical therapy.

Her perceived pain and discomfort initially improved while undergoing pelvic floor physical therapy; however, eventually her pain began to progress and she noted that she needed to reduce the size of the

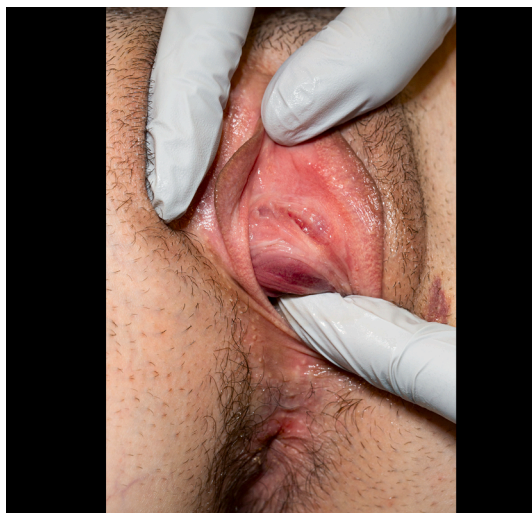
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**Fig. 1.** MRI and ultrasound appearances of glomangioma. MRI images (a-h) demonstrates a well circumscribed mass (arrow) with predominantly hyperintense signal on T2W images with a hypointense rim (sagittal, a; coronal, b; axial, c) and hypointense signal on T1W images (axial, d; sagittal, g). Note the mass displaces urethra to right (arrow, c) and indents on the left anterior wall of vagina (v). Post intravenous gadolinium enhanced images (e, f) show heterogeneous spotty enhancement initially (e) and continues to show more enhancement in later phase, but heterogeneity persists (axial, f, sagittal, h). Longitudinal view (i) of the anterior wall of vagina during ultrasound guided biopsy showing the heterogeneous and mildly echogenic mass (arrow) with increased vascularity. UB = urinary bladder, p = pubic bone, and v = vagina.



**Fig. 2.** Left upper vaginal/vulvar mass as observed during preoperative physical exam.

dilators utilized in pelvic floor physical therapy. A pudendal nerve block reduced her pain for about one month, but her pelvic pain returned with walking, squatting, and jumping, and she noted palpating a quarter-

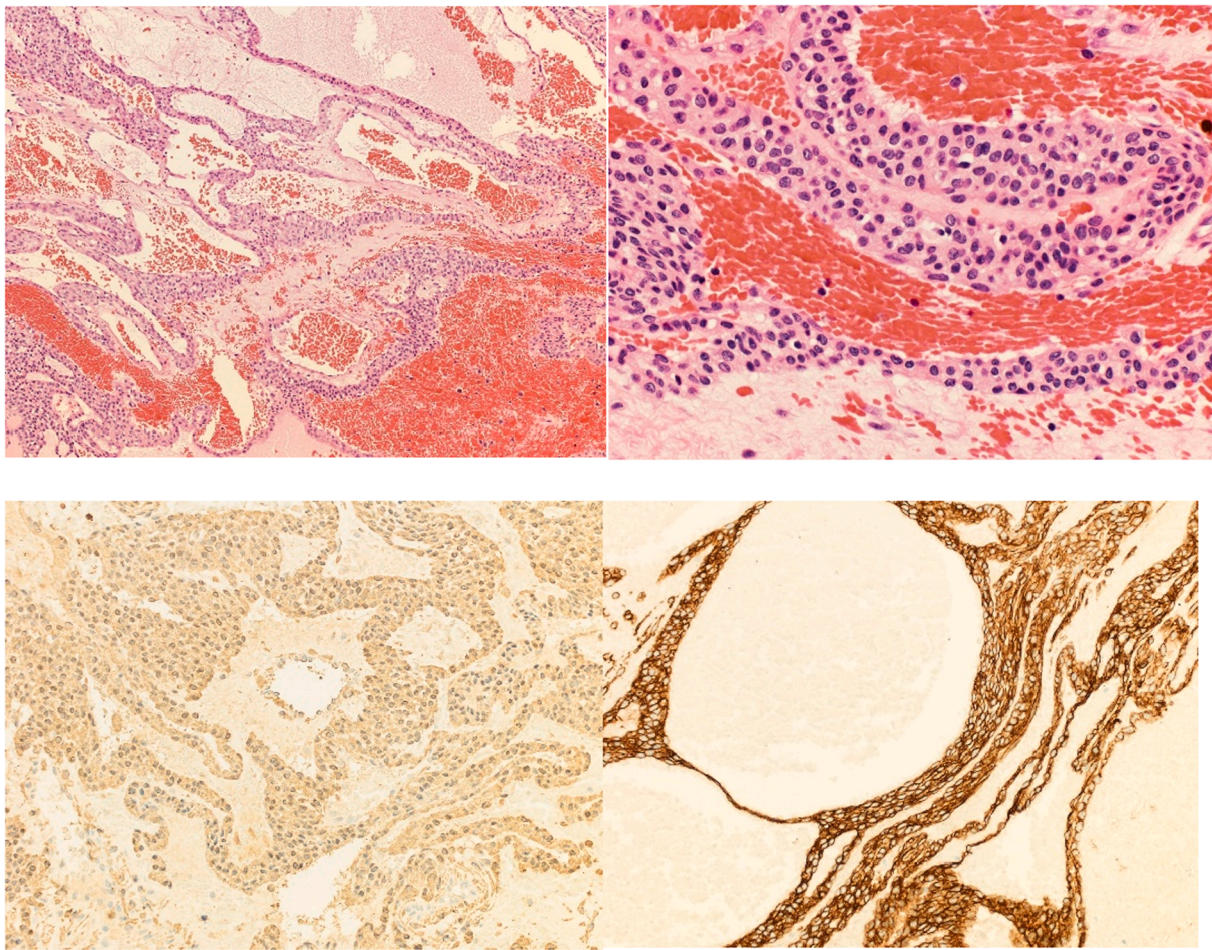
sized lesion on the left upper vagina. This was also noted by the pelvic floor physical therapist.

An MRI performed before her appointment with the gynecologist, demonstrated a 2.8 cm well-defined lesion in relation to the lower vagina (Fig. 1), which was initially thought to represent an aggressive angiofibroma. Fine needle aspiration was positive for neoplasm, compatible with glomangioma with positive immunostains for smooth muscle actin and desmin. Her case was presented at the tumor board and unanimous consensus was reached to pursue surgical excision as this has been the standard of care for glomus tumors occurring elsewhere in the body.

Prior to surgical excision, a pelvic exam was performed under anesthesia to aid in demarcating the borders of the mass. (Fig. 2).

Excision was performed through a 4 cm incision on the left vulva, with the patient in the dorsal lithotomy position. Careful dissection was performed around the mass until it was completely cleared of all attachments. The base of the mass was highly vascularized, and hemostasis was challenging due to the venous connections as described in the literature. Cautery and sutures were used to initially achieve hemostasis. Due to continued oozing Surgicel™ placement and pressure were additionally utilized to achieve adequate hemostasis. Primary closure was then performed. No intra-operative or post-operative complications were encountered. Surgical pathology demonstrated a 2.7 cm glomus tumor of uncertain malignant potential (Fig. 3A,B,C,D).

Postoperative recovery was uneventful, and the patient recovered



**Fig. 3.** A: Hematoxylin and eosin stain (H&E) at 10x. Dilated vascular spaces surrounded by glomus cells. B: Hematoxylin and eosin stain (H&E) at 40x. Relatively uniform round glomus cells with eosinophilic cytoplasm. C: Smooth muscle actin immunostain (SMA) is diffusely positive in the tumor cells. D: Collagen IV immunostain surrounds every individual glomus cell.

well and was back to normal activities at six weeks post-surgery. The decision was made for follow-up imaging via MRI every six months for the proceeding two to three years to look for recurrence. Her first MRI occurred three months post-surgery due to continued dyspareunia. No evidence of recurrence was noted. The patient later sought genetic testing at 7 months post-surgery and was found to be heterozygous for a rare autosomal dominant mutation of the [GLMN gene](#).

### 3. Discussion

Glomus tumors are rare neoplasms and arise from the glomus body, a thermoregulatory arterial-venous shunt composed of modified smooth muscles. Glomus tumors are believed to be a form of hamartoma of the glomus body. They are classified into either a solitary form (more common – 90%) or a multiple form (rare) which is also referred to as glomangioma ([Schopp et al., 2009](#)).

The GLMN gene encodes a phosphorylated protein crucial for normal vascular development. GLMN mutations are associated with glomuvenous malformations and increase the risk of developing glomangiomas ([Brauer, 2011](#)). In those who are heterozygous for this type of mutation, as was our patient, a somatic second-“hit” mutation is required for the development of glomuvenous malformations. Penetrance thereby increases with age, reaching approximately 80% penetrance by age 20 and nearly 100% penetrance by age 30. Glomus tumors are so rare, that identification of one should raise the consideration of gene testing.

Solitary glomus tumors arise from the dermis and subcutis, more often occurring in females with predilection for digits, particularly nail

beds where they appear as red to blue nodules which tend to be painful during changes in temperature especially in the cold. However there have been cases of glomus tumor arising in other organs such as lung, gastrointestinal tract and kidneys, which can present with vague symptoms related to the region. There are also cases of male genital tract glomus tumors. Histologically these are well circumscribed soft tissue tumor consisting of small uniform round cells with oval nuclei surrounding a vessel ([Mravic, 2015](#); [Moldavsky, 1998](#)).

Multiple glomus tumors are more common in children and can range from 2 nodules to 100 or more, limited to one region or entire body, but commonly involve trunks and upper extremities, and less likely to be painful compared to solitary glomus tumors. Histological specimens are necessary to differentiate them from solitary glomus tumors as well as hemangiomas. When compared to solitary tumors they are larger lesions that are not well-circumscribed, and contain irregular and dilated vessels, with aggregates of glomus cells found in the dilated vascular spaces ([Brauer, 2011](#)).

Imaging modalities can be used to aid in diagnosis, with MR being the most sensitive modality. Glomus tumors appear as a mass of intermediate or low signal on T1 weighted images and high signal on T2 weighted images. They also will show a diffuse enhancement with gadolinium contrast. Although larger tumors can have heterogenous appearance which makes it difficult to differentiate from other vascular tumors or sarcomas ([Glazebrook, 2011](#)). Because of the rarity of this diagnosis, and the inability to differentiate from other malignant processes, it is likely that patients with these types of masses will have resection with gynecologic oncologists.

Certain characteristics on MRI imaging can help to differentiate gynecological glomus tumors from other neoplasms. Vulvar squamous cell carcinoma appears as a mass with intermediate signal intensity on T2 weighted MRI imaging. While vulvar lymphoma which can be primary or secondary malignancy, is typically seen as a homogenous central solid mass with avid enhancement. Other malignancies such as melanoma can show intermediate to high signal intensity on T1 weighted images because of the paramagnetic effects of melanin (Hosseinzadeh et al., 2012).

Glomus tumors of vagina are rare with only a handful of cases reported in literature. The imaging appearances described of gynecological glomus tumors seem to show high intensity on MRI T2 weighted images with enhancement or homogeneity following contrast administration similar to tumors occurring in the extremities that show hyperenhancement with gadolinium injection, although absence of these findings does not exclude glomus tumor (Xie, 2021). The final diagnosis is based on surgical excision or biopsy. High degree of suspicion is required, and clinical correlation of characteristic pain would be helpful for imaging diagnosis.

The definitive treatment for glomus tumors is surgical resection. This can provide pain relief for solitary tumors. Recurrence of tumors is common in both variants for example due to incomplete excision in solitary tumors or infeasible resection of all nodules in a disseminated multiple form of glomus tumors (McDermott and Weiss, 2006). Surgery can be complicated by bleeding given the nature of the venous malformation with glomus cells which is referred to as glomuvenous malformations especially in the glomangioma variant (Mallory, 2006).

In conclusion, extradigital glomus tumors are a diagnostic challenge because of the variations in the presenting symptoms. This hurdle can prolong the discomfort experienced by the patient as seen in our case, emphasizing the need for a better diagnostic approach. While MRI is the most sensitive imaging modality in identifying extradigital tumors, biopsy remains the definitive method of diagnosis with excisional surgery

as the optimal treatment.

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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