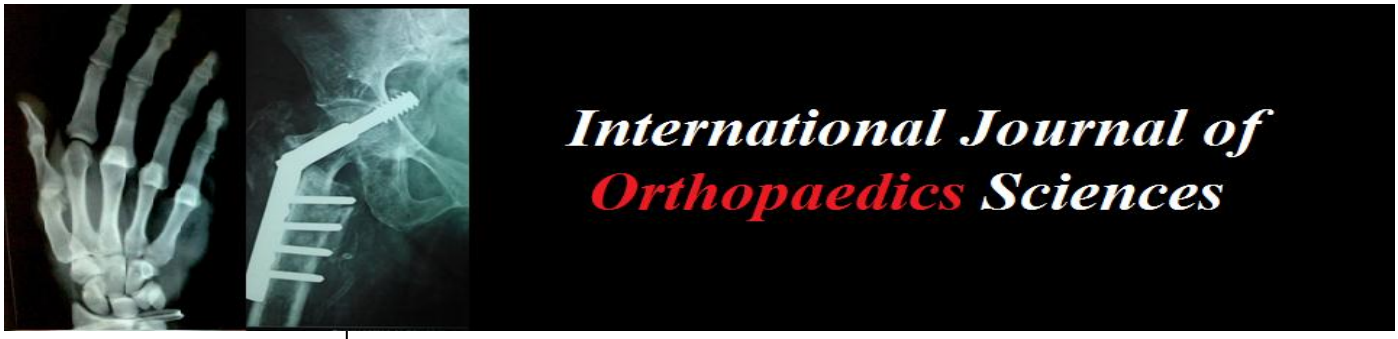


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# Clinical and histopathological diagnosis of glomus tumor: A 6 year institutional retrospective study

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**Abstract**
**Background:** Glomus tumors are rare and benign neoplasms that can be under diagnosed and commonly confused for melanocytic or vascular lesions [1]. Patients with such tumor can present to various medical specialties such as family medicine, orthopedics, dermatology or plastic surgery [2]. Those patients usually report a long duration of non-specific symptoms such as pain and temperature intolerance [2, 3]. It is common for such patients to undergo incorrect diagnosis, multiple imaging studies and potential delayed management [2, 3].
**Methods:** In this paper we are presenting the first study in the Kingdom of Bahrain to address a 6-year retrospective institutional review of all surgical histopathology cases of glomus tumor in a single medical center from 2014 to 2019.
**Results:** A histopathological diagnosis of glomus tumor was most common in patients in their third to sixth decades of life. The mean patient age was 45.5 ± 11.9 (mean ± SD) years with 48% (15/31) males and 52% (16/31) females. 45% (14/31) of patients received the clinical diagnosis of glomus tumor at the initial presentation prior to the availability of the histopathology or imaging report. The mean patient age was 48.1 ± 12.9 (mean ± SD) years with equal presentation of males and female gender. The most common anatomical site reported was a lesion in the finger 71% (22/31). Other reported anatomical sites were in the toe 10% (3/31), arm 6% (2/31), leg 3% (1/31), foot 3% (1/31), back 3% (1/31), and middle ear 3% (1/31). The median glomus tumor specimen thickness was 0.35cm. The main differential diagnoses used at the initial presentation were glomus tumor 45% (14/31), lesion 10% (3/31), granuloma 6% (2/31), neuroma 6% (2/31), and epidermal cyst 3% (1/31). The majority of the patients with such tumors underwent X-Ray and Doppler Ultrasound (US) studies.
**Conclusion:** This study demonstrated that glomus tumor occurred in several sites however the majority were located in the hand. There may be a role of cost-effective imaging study for example Doppler Ultrasound (US) in the early diagnosis and the management of patients with glomus tumor.

**Keywords:** Glomus tumor, hand, immunohistochemistry, imaging

## Introduction
Glomus tumor also known as Glomangioma was first described by Wood in 1812 [4]. It is a small vascular neoplasm typically comprised of three components; glomus cells, smooth muscle cells, and vasculature [5]. It constitutes around 2% of the soft tissue tumors and arises predominantly from mesenchymal cell line [5, 6]. The modified smooth muscle cells of the glomus body are involved in temperature regulation [7]. Although the exact etiology of glomus tumor is still unknown, it is suggested that it arises from a structure weakness in a glomus body [1, 8]. Glomus tumor most commonly reported in literature in the fingertips and it is proposed to be related to multiple factors such as sex, age, trauma, or inheritance [9, 10]. Due to the rarity of such cases and the lack of diagnostic criteria, there are chances of misdiagnosing glomus tumor [1]. The purpose of this article is to present an institutional review of all surgical histopathology cases of glomus tumor between 2014 and 2019.

## Methods
This is a 6-year retrospective review of all surgical histopathology reports of patients with glomus tumor within the largest public hospital in the Kingdom of Bahrain. Registries generated at the Department of Pathology and Laboratory Medicine via SNOWMED codes

Using I-SEHA; the official EMR (Electronic Medical Record) adopted at the hospital. We identified 31 patients from 2014 to 2019 with excision biopsy reports confirming the diagnosis of glomus tumor. Data analyzed included the patients' demographic information, location of the lesion, pathological diagnoses, immunohistochemical studies, and radiological reports. We compared the histopathology result versus the clinical diagnosis of patients with glomus tumor. In addition, we summarized the role of radiological imaging in the diagnosis of glomus tumors in the extremities.

## Results

A histopathological diagnosis of glomus tumor was most common in patients in their third to sixth decades of life (range 18-71 years) as seen in Figure 1. The mean patient age was 45.5 ± 11.9 (mean ± SD) years with gender presentation of 48% (15/31) in males and 52% (16/31) in females (Figure 2). 45% (14/31) of the patients received the clinical diagnosis of glomus tumor at the initial presentation prior to the availability of the histopathology or imaging report. The mean patient age was 48.1 ± 12.9 (mean ± SD) years (Figure 3). Data collected showed an equal presentation of males and female gender with approximately 1:1 ratio (Figure 4).

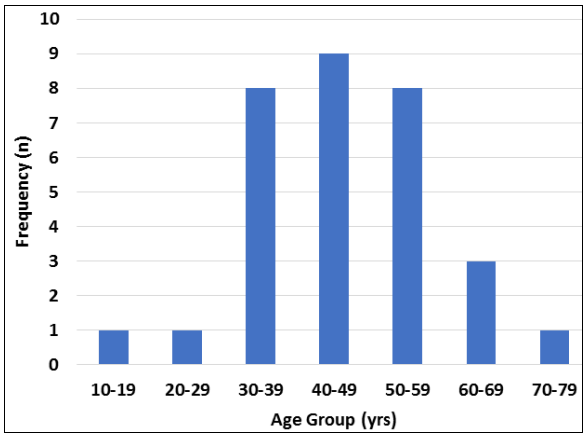


**Fig 1:** Number of patients with histopathology diagnosis of glomus tumor by age group (yrs)

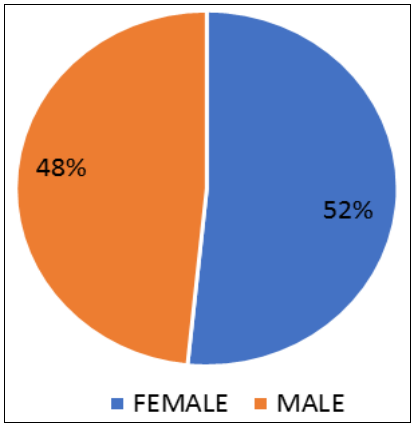


**Fig 2:** Gender distribution (%) of patients with histopathology diagnosis of glomus tumor

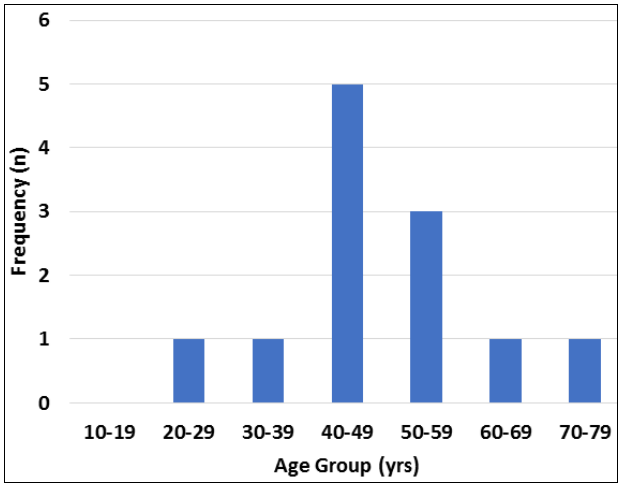


**Fig 3:** Number of patients with clinical diagnosis of glomus tumor at initial presentation by age group (years)

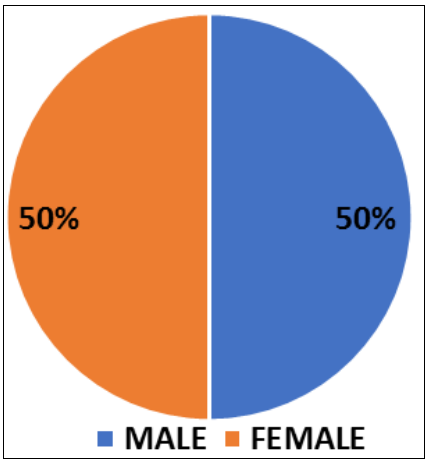


**Fig 4:** Gender distribution (%) of patients with clinical diagnosis of glomus tumor at initial presentation

The most common anatomical site was a lesion in the finger 71% (22/31) in addition to toe 10% (3/31), arm 6% (2/31), leg 3% (1/31), foot 3% (1/31), and back 3% (1/31). Other reported location was in the middle ear 3% (1/31) (Figure 5). The median glomus tumor specimen thickness was 0.35cm. The range was 0.1 to 0.8cm (Figure 6).

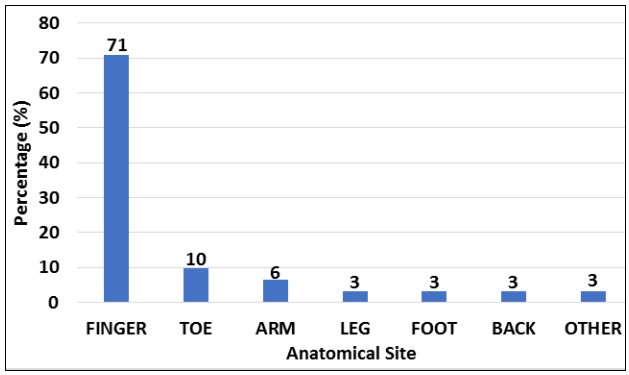


**Fig 5:** Percentage (%) of glomus tumor by site

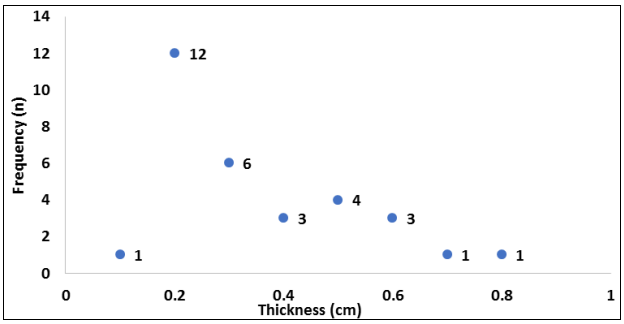


**Fig 6:** Distribution of glomus tumor by maximum thickness (cm)

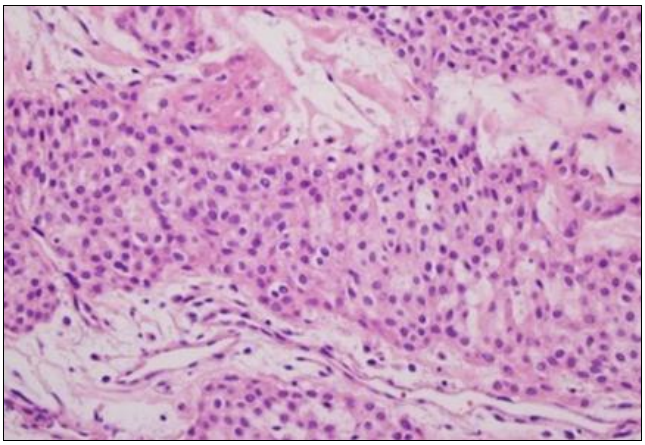

**Fig 7:** Routine hematoxylin and eosin (H&E) stain under 100x. Magnification

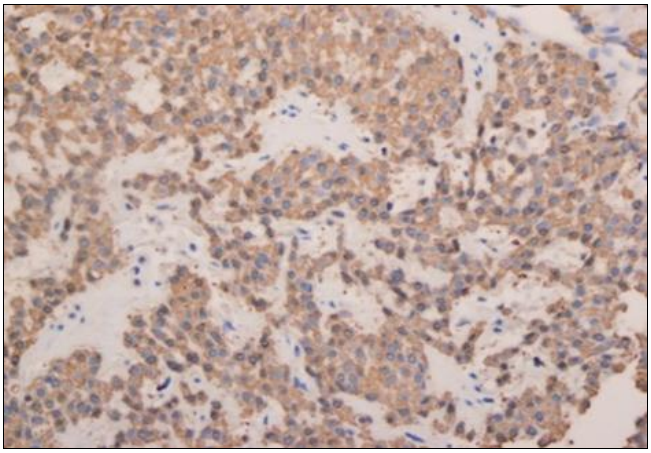

**Fig 8:** αSMA highlights diffuse staining of lesion cells

Immuno histochemical stains were performed on 23 samples out of 31. The typical glomus tumor histological description on routine hematoxylin and eosin (H&E) stain demonstrates sheets of monomorphic round cells arranged around blood vessel. The stroma is collagenous with myxoid changes (Figure 7). The immunohistochemical analysis showed positive αSMA stain (Figure 8) in 100% of the reported cases (23/23), CD34 immunostaining positive in 39% (9/23) of cases where as MSA and CD31 immunostaining were positive in 9% (2/23) of the cases (Table 2).

Clinical diagnoses entered in the patients' medical records prior to the availability of the histopathology or radiological studies were the following: glomus tumor 45% (14/31), lesion 10% (3/31), granuloma 6% (2/31), neuroma 6% (2/31), and cystic changes such as epidermal cyst 3% (1/31). The complete list is summarized in Table 1. The percentage of patients underwent more than one imaging study was 58% (18/31). Doppler ultrasound (US) was the most common radiological study ordered along with X-Ray and it accounts for 35% (11/31) of patients with glomus tumor. Patients with no imaging studies work up had a glomus tumor diagnosis rate of 33% (4/12) prior to any surgical intervention. 91% (10/11) of patients underwent doppler ultrasound (US) had a diagnosis of glomus tumors in their reports whereas patients with Magnetic Resonance Imaging (MRI) and *Computerized Tomography* (*CT*) scan had 100% (4/4 & 1/1) of glomus tumor diagnosis (Table 3).

**Table 1:** Differential diagnosis used in the first clinical consultation

| Differential Diagnosis | Frequency (n) |
|---|---|
| Glomus Tumor | 14 |
| Lesion | 3 |
| Granuloma | 2 |
| Neuroma | 2 |
| Hemangioma | 1 |
| Verucca Plantaris | 1 |
| Vilonodular Synovitis | 1 |
| Angio-Neurofibroma | 1 |
| Morton Neuroma | 1 |
| Osteophyte | 1 |
| Localized Swelling | 1 |
| Cyst Tissue Tumor | 1 |
| Tendinitis | 1 |
| Epidermal Cyst | 1 |

**Table 2:** Immunohistochemical analyses of glomus tumor specimens

| Immunochemical Stain | Frequency (n) | Percentage (%) |
|---|---|---|
| αSMA | 22/23 | 96 |
| CD34 | 9/23 | 39 |
| MSA | 1/23 | 4 |
| CD31 | 1/23 | 4 |
| S-100 | 0/9 | 0 |
| None | 8 | 26 |

**Table 3:** Radiographic studies requested

| Imaging Study | Frequency (n) | Glomus Tumor Diagnosis* | Percentage (%) Glomus Tumor Diagnosis** |
|---|---|---|---|
| X-Ray | 21 | 0/21 | 0 |
| Doppler US | 11 | 10/11 | 91 |
| MRI | 4 | 4/4 | 100 |
| CT | 1 | 1/1 | 100 |
| None | 12 | 4/12 | 33 |

*Number of radiological reports with glomus tumor diagnosis
**Percentage of radiological reports with glomus tumor diagnosis

## Discussion

This is the first institutional review in Gulf Cooperation Council (GCC) region that described the histopathology cases of glomus tumor and compared the clinical diagnosis to the pathological ones. Although our sample size is small, the study showed similar results to other papers published in literature in terms of the tumor most common anatomical site [10, 11, 12]. However; the overall sex gender dominance was not

seen in this study in a large margin. Glomus tumor should be suspected in patients presenting with distal phalynx pain with no apparent cause. We have found out that imaging studies such as Ultrasound (US), Magnetic Resonance Imaging (MRI) or *Computerized Tomography* (*CT*) scan aided in the diagnosis process and showed a relatively similar results in comparison to the histopathology reports (Table 3). However, none of the X-Ray imaging studies reported the impression of glomus tumor.

## Conclusion

Patients with glomus tumor usually present with chronic pain that requires surgical intervention[13]. This study demonstrated that glomus tumor occurred in several sites however the majority were located in the hand. Due to the lack of diagnostic criteria available, there may be a role of a cost-effective imaging study for example doppler ultrasound (US) in the early diagnosis and the management of patients with glomus tumor.

## Conflict of Interest

There is no conflict of interest to declare.

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