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Technical Tips

Glomus tumor of the hallux: a technical tip and narrative review

Suellen Hornos Vieira[1], Mariana Cristina Apude[1], Lucca Pappas Ditleff[1], Lucas Park Han[1], Alexandre Leme Godoy dos Santos[1,2], Adilson Sanches de Oliveira Junior[1]

1. Hospital Israelita Albert Einstein, São Paulo, SP, Brazil.
2. Departamento de Ortopedia e Traumatologia, Faculdade de Medicina, Universidade de São Paulo, São Paulo, SP, Brazil.

Abstract

Glomus tumors are benign and rare neoplasms, with few cases reported in the lower extremities. This study describes a case of glomus tumor in the hallux, with an atypical location, detailing the surgical resection technique employed and its excellent clinical outcome. A narrative review related to the incidence, clinical characteristics, and therapeutic options for this benign tumor.

Level of Evidence V; Therapeutic Study; Expert Opinion.

Keywords: Glomus tumor; Neoplasms; Hallux; Lower extremity.

Introduction

Originally described by Wood in 1812 and named by Mason in 1924[1], the glomus tumor is a benign neuromyoarterial neoplasm[2-4]. This clinical condition can occur throughout the body surface but is more commonly found in the extremities and the pre-coccygeal region, representing approximately 1.5% of distal soft tissue neoplasms[2,3].

The glomus body has the main function of thermoregulating the region where it is located[1-3,5]. Its anatomical structure is composed of an afferent artery, an arteriovenous anastomosis[4,6] of the Sucquet-Hoyer canal, an intraglomerular reticulum[1], and a modified smooth muscle cell capsule[2,5,6]. The regulation of blood pressure within this anatomical structure enables thermoregulation. Thus, it has three main components[1,2,5]: the glomus cell (derived from a modified musculature of cuboidal cells), the blood vessels, and smooth muscle cells.

The pathophysiology involves the proliferation of one of these components, leading to glomus tumor formation. Traumatic or infectious events may play a role[3]; however, the etiology remains incompletely understood[4].

Its classification is based on the proportion of hyperplasia components[1] and includes solid glomus tumors, glomangiomas, and glomangiomyomas. Solid types are the most common, representing 75% of cases, followed by glomangiomas (20%) and glomangiomyomas (5%)[5,6].

Approximately 75% of glomus tumors occur in the hands, particularly in the subungual region, and are more frequently reported in women[1,3,5,7]. However, they are not exclusive to females. When located in other regions, such as the subungual area of the toes, they are more commonly observed in men, as illustrated in this technical report[2,5].

Due to the rarity of glomus tumors in the feet, whether subungual or intraosseous, diagnosis is often delayed[5,8].

This case report and technical tip describe a case of glomus tumor of the hallux, with an atypical location and excellent clinical result, and provide a narrative review of this pathology.

Study performed at the Hospital Israelita Albert Einstein, São Paulo,SP, Brazil.

Correspondence: Adilson Sanches de Oliveira Junior. Av. Albert Einstein, 627, 05652900, Morumbi, São Paulo, SP, Brazil. **Email:** dr.adilsonsanches@gmail.com.
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Case report

A 40-year-old male patient reported severe pain on contact at the base of the left hallux nail and sensitivity to cold, with symptoms persisting for three years. At the initial physical examination, the patient had severe pain on compression at the base of the nail and in the nail matrix of the left hallux (Love test), without irradiation or pain around the area.

The clinical aspect raised the suspicion of a glomus tumor, prompting load-bearing radiographs (Figure 1A) and contrast-enhanced magnetic resonance imaging (MRI). While radiographs showed no abnormalities, MRI revealed a 2.5 mm contrast-enhancing nodular lesion in the central portion of the nail matrix of the affected hallux (Figure 1B and C), supporting the initial diagnosis of a glomus tumor.

Following a shared decision-making process between the medical team and the patient, surgical resection of the lesion was performed, followed by anatomopathological analysis.

Description of the surgical technique

The surgical procedure began with pre-anesthetic marking of the lesion based on the specific location of the pain. (Figure 2A). This was followed by spinal anesthesia, exsanguination of the left lower limb, and inflation of a pneumatic tourniquet at the proximal thigh to 280 mmHg.

Two small incisions were made at the proximal nail fold to isolate the eponychium, which was sutured with Vicryl to preserve the tissue and allow clear visualization of deeper structures. The nail was then carefully detached from its bed, exposing the nail matrix (Figure 2B-D).

A tumor impression measuring approximately 3 mm was identified on the nail matrix (Figure 2E-F), then the nail matrix was sectioned, revealing the tumor (Figure 2G-H). Complete excision of the lesion was then performed using an *en bloc* technique (Figure 2I); the specimen was subsequently sent for histopathological analysis. The nail matrix was sutured with 5-0 Monocryl (Figure 2J), and the nail was repositioned and stabilized using 3-0 nylon sutures in simple cardinal points, allowing the nail to function as a biological dressing (Figure 2K).

Anatomopathological analysis confirmed the diagnosis. The patient was followed for two years, during which there was complete resolution of pain in the immediate postoperative period and no recurrence of symptoms or lesion. Six weeks after surgery, the nail detached and was gradually replaced by new growth, reaching an almost normal appearance by the two-year mark (Figure 3).

Discussion

Although glomus tumors are well documented in the upper extremities, reports of their occurrence in the lower limbs are rare[2], likely due to the low prevalence of these tumors in the foot region[7]. They have also been identified in anatomical locations not typically containing glomus bodies. One hypothesis suggests that such tumors may arise from other perivascular cells capable of differentiating into glomus cells, as described in cases involving atypical anatomical sites[5,6].

Glomus tumors most commonly occur between the ages of 20 and 40, with a lower incidence in children and the elderly. They typically present as solitary lesions, while multiple lesions are less frequent and more often seen in young males[5,8]. Due to the limited number of reported cases involving the foot, no definitive conclusions can be drawn regarding sex distribution in this anatomical location[3].

This condition presents with a varied clinical spectrum. The classic symptom triad includes cold sensitivity, intense paroxysmal pain, and tenderness to palpation[1,3,5,8,9]. Although common, these symptoms are not mandatory for diagnosis. Solid glomus tumors, for instance, present with pain in approximately 80% of cases and cold sensitivity in 63%, whereas multiple glomus tumors are often painless[5].

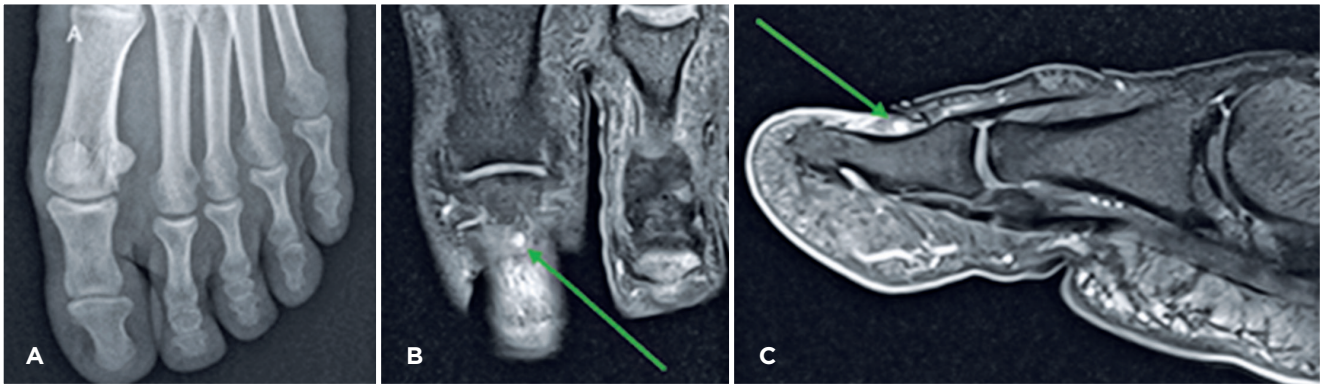

Figure 1. A) Anteroposterior radiograph of the left foot under load. B) Coronal T2-weighted magnetic resonance imaging with contrast showing a hyperintense lesion. C) Sagittal T2-weighted magnetic resonance imaging with contrast demonstrating enhancement in the central portion of the hallux nail matrix, measuring approximately 2.5 mm.

The symptomatology of this neoplasm is associated with the transformation of glomus cells into oval and round forms[6], often accompanied by mast cells at the lesion site[4]. Although the exact mechanism of pain is not fully understood, it is believed to involve the release of substance P peptide by peripheral nerves in response to cold stimuli[2,5], along with other mediators secreted by surrounding mast cells[4].

In addition to pain, clinical signs may include nail deformities with bluish discoloration[4] and a well-circumscribed protrusion[2,3]. Patients may also report difficulty wearing shoes, pain unresponsive to analgesics, and radiation of discomfort to areas adjacent to the lesion.

Discomfort is typically triggered by tactile stimulation at the tumor site but may progress to spontaneous pain that

Figure 2. A) Preoperative lesion demarcation. B) Planned incisions at the proximal nail fold. C) Exposure of the eponychium. D) Detachment of the nail from the entire bed. E, F) Visualization of the tumor impression relative to the nail matrix and measurement of lesion size. G, H) Identification and demarcation of the lesion. I) Excised glomus tumor. J) Suture of the nail matrix. K) Nail repositioned and stabilized in its original bed.

Figure 3. Clinical image of the foot in the late postoperative period under load. A) Dorsal view. B) Front View.

persists at rest. Additional features can include edema and either inflammatory or non-inflammatory changes of the eponychium[2], which may be mistaken for onychocryptosis.

There are reports of symptom variation with temperature changes[6], typically associated with cold sensitivity[2-4]. Pain may present as diffuse over the nail bed or as sharp and localized, caused by stimulation with a pointed object[4,8]. This is known as the Love test[3,5,8], which demonstrates 100% sensitivity but 0% specificity[2].

Another diagnostic method is Hildreth's sign, which involves the disappearance of pain or a negative Love test after applying a tourniquet above systolic pressure to the affected limb[3,8]. This sign is particularly valuable in cases involving foot or toe tumors[5], with reported sensitivity ranging from 77% to 92% and specificity between 91% and 100%, depending on the vascular nature of the lesion[2,5].

In cases with inconclusive clinical findings or when further investigation is required, imaging methods such as ultrasound or MRI can be highly valuable[1,2,4,5,9]. On ultrasound, glomus tumors typically appear as hypoechogenic lesions, and Doppler imaging may reveal hypervascularization in the affected area[5].

Magnetic resonance imaging offers greater diagnostic accuracy, especially in cutaneous glomus tumors[5]. In cases with high clinical suspicion, MRI is a valuable tool for both diagnosis and surgical planning[5]. Glomus tumors typically appear as well-defined lesions with low signal intensity on T1-weighted images and high signal intensity on T2-weighted images[1-3,5,8], as shown in Figures 1 and 2. Due to their vascular etiology, these tumors often enhance with gadolinium-based contrast agents[1,4,5]. However, not all glomus tumors exhibit detectable changes on MRI[1,8].

Other diagnostic tools include radiography, which may reveal semispherical erosions with well-defined margins[2]. When correlated with high clinical suspicion, such findings can be observed in 30% to 60% of cases, reflecting tumor growth[2].

Once a glomus tumor is diagnosed, surgical excision is the treatment of choice[2-6,9]. This approach typically provides rapid relief of pain and other associated symptoms.

Although alternative treatments, such as sclerotherapy and the use of argon or carbon dioxide lasers, exist, typically for superficial and deep lesions, respectively[5], they are rarely employed. Additionally, indomethacin has been reported to alleviate tumor-related symptoms after ten days of treatment[2].

The primary goal of surgical treatment is complete symptom resolution. However, recurrence, though rare, may occur due to incomplete excision or the development of a new lesion. Moreover, meticulous surgical technique and precise repositioning of the nail onto its original bed, without injuring the matrix, are crucial for achieving optimal aesthetic outcomes.

Conclusion

A thorough understanding of the anatomical, pathophysiological, and epidemiological aspects of glomus tumors, combined with early imaging-based diagnosis and the application of appropriate surgical techniques, enables excellent postoperative clinical outcomes.

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