Scientific Research Publishing

Modern Plastic Surgery, 2025, 15(3), 92-104
https://www.scirp.org/journal/mps
ISSN Online: 2164-5280
ISSN Print: 2164-5213

Glomus Tumors of the Hand: A Striking Clinical Problem Frequently Missed

Ahmed A. Elhefnawy, Sherif A. Hantash, Wael H. Mahmoud*, Mohamed M. Khedr

Plastic Surgery Department, Tanta Faculty of Medicine, Tanta, Egypt
Email: ahmed.elhefnawy@med.tanta.edu.eg, sherif.hantash@med.tanta.edu.eg, waelhussein558@gmail.com, mohamed.khedr@med.tanta.edu.eg

How to cite this paper: Elhefnawy, A.A., Hantash, S.A., Mahmoud, W.H. and Khedr, M.M. (2025) Glomus Tumors of the Hand: A Striking Clinical Problem Frequently Missed. *Modern Plastic Surgery*, **15**, 92-104.
https://doi.org/10.4236/mps.2025.153008

Received: May 1, 2025
Accepted: July 11, 2025
Published: July 14, 2025

Abstract

Introduction: Glomus tumors of the hand usually present with classical triad of paroxysmal pain in fingertips, tenderness, and cold sensitivity. However, they often go undiagnosed or misdiagnosed for years and followed by inadequate treatment. We aimed to present our experience with the management of glomus tumors of the hand, which were analyzed according to their clinical presentation, diagnosis, surgical approach, and outcome. **Material and Methods:** Seventeen patients with clinical diagnosis of hand glomus tumors operated between 2013 and 2023 were retrospectively reviewed. The data collected included demographics, presenting symptoms, duration, physical examination including Love test, Hildreth test, and cold sensitivity test, diagnostic imaging including X-ray, ultrasonography and MRI, treatment, and outcome. **Results:** The mean age was 42.35 years (range: 25 - 59 years), and the female to male ratio was 14:3. The mean duration of symptoms was 2.4 years (range: 1 - 5 years). Ten (58.8%) cases had left-hand affection. Nine (52.9%) patients had nail bed changes. Transungual approach was done in 13 (76.5%) patients, while lateral subperiosteal approach was done in 4 (23.5%) patients. The mean tumor size was 5.76 mm (range: 3 - 9 mm). 16 cases were found to have histopathologically proven glomus tumors, while one patient had a non-specific fibrotic lesion and returned with pain recurrence. There was no other patient who experienced recurrence of symptoms. None of our patients developed nail bed deformity during a mean follow-up period of 7.2 months. **Conclusions:** Early and accurate diagnosis of glomus tumors of the hand should be made by utilizing a combination of thorough history taking, clinical tests and imaging tools. Complete surgical excision is the only effective method for treatment and recurrence prevention. Transungual approach followed by meticulous repair of the nail bed is recommended for central lesions while lateral subperiosteal approach is recommended for peripheral lesions.

Keywords

Glomus Tumors, Hand, Painful Lesions, Fingertips

1. Introduction

Glomus tumors are rare, benign, vascular hamartomas that account for 1% - 5% of all soft-tissue tumors of the hand, and approximately 65% of them are located in the fingertips, particularly in the subungual region [1]. They arise from the glomus body in the reticular dermis, which is considered as a contractile neuromyoarterial structure that plays a critical role in thermoregulation and controls blood pressure by regulating peripheral blood flow [2] [3]. The tumors mainly occur in females and usually present as pinkish red or bluish discoloration of the nail plate with classical triad of paroxysmal pain, pinpoint tenderness in the finger, and cold hypersensitivity [4]. Supportive clinical tests include Love pin test, Hildreth test, and cold sensitivity test [5]. In addition to the clinical tests, X-ray, Doppler ultrasonography and magnetic resonance imaging (MRI) are valuable methods of imaging glomus tumors [6].

Glomus tumors require careful assessment for differential diagnosis of other painful lesions in the tip of the finger, such as neuroma, eccrine spiradenoma, leiomyoma, crystal arthropathy, hemangioma, mucous cyst or osteochondroma [7]. They often go undiagnosed or misdiagnosed for years as the tumors can present to outpatient clinics of multiple specialties (dermatology, rheumatology, neurosurgery, and orthopedics). There is a well-documented mean diagnostic delay of about 7 years due to the small size, benignity, rarity, lack of common knowledge about the condition, and varying presentations [8]. They are followed by inadequate treatment, due to the chronic pain in all extremities they accompany [9]. The surgical approach necessitates the elevation of both nail and nail beds to access such small lesion. This surgical procedure carries its morbidity [10]. The resulting shape of the regenerated nail will be affected depending on how much of the nail bed was removed during excision [11]. Therefore, the decision to surgically treat a subungual glomus tumor depends on the initial diagnostic findings drawn from both clinical and radiographic examination [12] [13]. This study therefore set out to present our experience with the management of glomus tumors of the hand which were analyzed according to their clinical presentation, diagnosis, surgical approach, and outcome.

2. Materials and Methods

From January 2013 to January 2023, a retrospective review of 17 patients who underwent surgical treatment under clinical suspicion of hand glomus tumors at Plastic Surgery Department, Tanta University Hospitals, after approval of our University Ethical Committee (36264PR1142/3/25) and written informed consent

regarding the treatment, photography and research publishing was obtained. Included were patients aged 18 years or older with a provisional diagnosis of glomus tumor and digital topography in the hand who had comprehensive medical records regarding demographic data, presenting symptoms, clinical test results, radiological investigation findings, treatment methods, histopathological results, and outcome of these patients. The exclusion criteria were: extradigital lesions, main subject other than glomus tumor, and lack of detailed medical records.

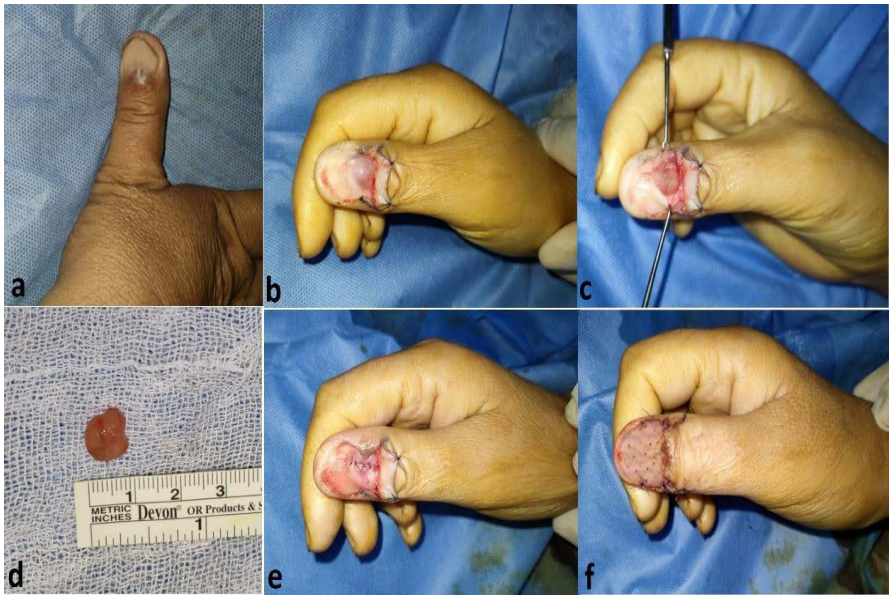

Figure 1. A 45-year-old female with a glomus tumor in subungual location of the right thumb; (a) Bluish discoloration with slight local swelling of the nail plate; (b) The nail plate was carefully removed not to damage the nail bed and a short cut-back incision in the eponychial fold was made for adequate exposure; (c) The nail bed was longitudinally incised over the tumor; (d) The tumor after complete excision with transungual approach (9 mm maximum diameter); (e) The nail bed was repaired by interrupted 7-0 absorbable sutures; and (f) The nail plate inserted after tumoral excision.

All patients were admitted with a chief complaint of excruciating pain in the fingertips on pressure and, or with exposure to coldness. For diagnosis, all cases underwent Love's pin test, Hildreth's test, and a cold-sensitivity test. Plain radiographs and magnetic resonance imaging (MRI) were performed in all patients. Ultrasonography (US) was additionally performed in five cases where no abnormal findings were detected in X-ray. All cases were treated by surgical excision as day-cases. All operations were done under digital nerve block anesthesia with 2.5x loupe-magnification, and under tourniquet control. The specific location of the lesion was outlined again on-table before the anesthesia was given. Subungual tumors were excised by the typical transungual approach while peripheral lesions on the radial or ulnar aspects of the digits were removed by the lateral subperiosteal approach. In performing the transungual approach, the nail plate was care-

fully removed not to damage the nail bed, which was longitudinally incised over the tumor that was removed completely. After tumor enucleation, the nail bed was repaired by interrupted absorbable sutures (Vicryl 7–0, Ethicon), and the nail plate was repositioned by interrupted non-absorbable sutures (Prolene 4-0, Ethicon) (Figure 1). All lesions were sent for histopathological examination (H&E). Suture removal was done on the 14th postoperative day. Subsequent follow-up visits were designed to be once monthly for 3 months and then every 3 months for one year. Patients were instructed to return in case of recurrence of symptoms and occurrence of postoperative nail deformity.

SPSS for Windows (Version 18.0, SPSS Inc., Chicago, IL, USA) was used for statistical analysis. Quantitative data were expressed as range and mean ± standard deviation (SD), whereas qualitative data were expressed as number and percentage.

3. Results

Among the 17 patients, the mean age at presentation was 42.35 ± 9.2 years (range: 25 - 59 years), and the female to male ratio was 14:3. The mean duration of symptoms before presentation was 2.4 ± 1.14 years (range: 1 - 5 years). Ten (58.8%) cases had left-hand affection, while seven (41.2%) cases had right-hand involvement. Six lesions were found in the thumb, two in the index finger, two in the middle finger, five in the ring finger, and two in the little finger. The lesions affected the subungual regions in 13 (76.5%) patients, the radial aspects of the digits in 3 (17.6%) patients, and the ulnar aspect of the digit in one (5.9%) patient (Table 1).

Table 1. Patient data.

Location	Duration, yr.	Pain	Nail changes	Cold sensitivity	Love test	Hildreth test	Imaging study	Method	Size mm.	Histopathology	Outcome	Follow up, mo.
Rt thumb, subungual	2	+ve	+ve	+ve	+ve	+ve	X-ray, MRI	Transungual	9	Glomus T	No recurrence, No nail deformity	6
Rt ring, subungual	1	+ve	-ve	-ve	+ve	+ve	X-ray, US, MRI	Lateral subpriosteal	5	Glomus T	No recurrence, No nail deformity	9
Lt ring, radial side	3	+ve	-ve	-ve	+ve	-ve	X-ray, US, MRI	Lateral subpriosteal	4	Glomus T	No recurrence, No nail deformity	3
Lt index, radial side	2	+ve	-ve	-ve	+ve	-ve	X-ray, US, MRI	Transungual	5	Glomus T	No recurrence, No nail deformity	12
Rt thumb, subungual	1	+ve	+ve	+ve	+ve	+ve	X-ray, MRI	Transungual	8	Glomus T	No recurrence, No nail deformity	9
Rt thumb, subungual	5	+ve	+ve	+ve	+ve	+ve	X-ray, MRI	Transungual	7	Glomus T	No recurrence, No nail deformity	9
Lt little, subungual	2	+ve	-ve	-ve	+ve	+ve	X-ray, MRI	Transungual	3	Glomus T	No recurrence, No nail deformity	6

Continued

Lt thumb, subungual	3	+ve	+ve	+ve	+ve	-ve	X-ray, MRI	Transungual	4	Glomus T	No recurrence, No nail deformity	12
Lt ring, radial side	2	+ve	-ve	+ve	+ve	+ve	X-ray, MRI	Lateral sub-priosteal	6	Glomus T	No recurrence, No nail deformity	6
Lt ring, subungual	3	+ve	-ve	-ve	+ve	-ve	X-ray, US, MRI	Transungual	5	Non-specific	Recurrence of pain	3
Lt ring, subungual	2	+ve	+ve	+ve	+ve	+ve	X-ray, MRI	Transungual	6	Glomus T	No recurrence, No nail deformity	3
Rt middle, subungual	1	+ve	+ve	+ve	+ve	+ve	X-ray, MRI	Transungual	6	Glomus T	No recurrence, No nail deformity	12
Rt index, ulnar side	2	+ve	-ve	-ve	+ve	-ve	X-ray, US, MRI	Lateral sub-priosteal	3	Glomus T	No recurrence, No nail deformity	9
Lt thumb, subungual	2	+ve	+ve	+ve	+ve	+ve	X-ray, MRI	Transungual	7	Glomus T	No recurrence, No nail deformity	3
Lt middle, subungual	3	+ve	+ve	+ve	+ve	+ve	X-ray, MRI	Transungual	8	Glomus T	No recurrence, No nail deformity	6
Lt thumb, subungual	5	+ve	+ve	+ve	+ve	+ve	X-ray, MRI	Transungual	9	Glomus T	No recurrence, No nail deformity	6
Rt little, subungual	2	+ve	+ve	-ve	+ve	+ve	X-ray, MRI	Transungual	3	Glomus T	No recurrence, No nail deformity	9

(M): male, (F): female, (Rt): right, (Lt): left, (T): tumor, (MRI): magnetic resonance imaging, (US); ultrasonograph.

Figure 2. MRI findings of a thumb glomus tumor (coronal view) (a) Low signal intensity on T1-weighted images (arrow); (b) Marked signal hyper-intensity on T2-weighted images (arrow); (c) Significant enhancement after gadolinium injection (arrow).

All patients had excruciating pain on touch and localized tenderness as the main symptoms caused by the lesions. Ten (58.8%) patients were found to have

cold sensitivity. Nine (52.9%) patients demonstrated nail changes, including 6 (35.3%) bluish discolorations and 3 (17.6%) deformities. The Love's test was positive in all 17 (100%) patients, while the Hildreth test was found to be positive in only 12 (70.6%) patients and the cold sensitivity test was positive in only 10 (58.8%) patients. Plain radiographs were inconclusive in 5 (29.4%) patients, while 12 (70.6%) patients demonstrated evidence of bony erosion on the distal phalanx. Color-Doppler sonography was performed selectively in 5 (29.4%) patients and was able to identify hypervascular lesions in only 3 (17.6%) patients. MRI was done in all patients and revealed low signal intensity on T1-weighed images, strong hyperintensity on T2-weighted images, and more enhancement on T1-weighted images after gadolinium injection in only 13 (76.5%) patients (**Figure 2**).

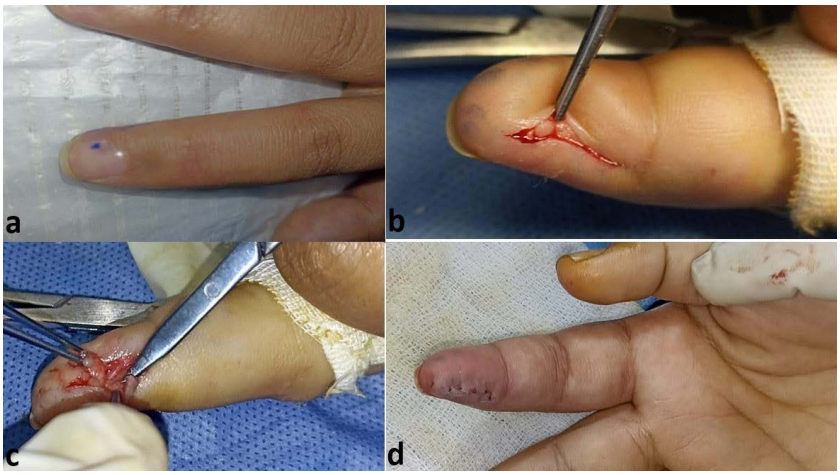

Figure 3. A 39-year-old female with a glomus tumor in ulnar aspect of the right index finger. (a) The point of maximal tenderness (blue dot) indicating the location of the glomus tumor; (b) The skin incision in the lateral subperiosteal approach; (c) The tumor mass in subungual region is directly accessed without retracting the interosseous structures; (d) Skin closure was done by interrupted 4-0 non-absorbable sutures.

Thirteen (76.5%) patients underwent transungual excision of the tumors, while four (23.5%) patients had their tumors removed by the lateral subperiosteal approach (**Figure 3**). The mean tumor size was 5.76 ± 1.95 mm (range: 3 - 9 mm). Histopathological examination revealed small lobules that were formed by multilayered perivascular epithelioid cells have sharply punched out centrally located nuclei with open chromatin and amphophilic or pale eosinophilic cytoplasm (**Figure 4**) that confirmed the diagnosis of glomus tumor in 16 (93.1%) patients except in one patient indicated non-specific fibrotic lesion. All wounds healed well without any possible complications such as surgical site infection or wound dehiscence. After a mean follow-up period of 7.2 ± 3.09 months (range: 3 - 12 months), there was no evidence of nail deformity or recurrence of the symptoms except in one patient who presented with pain recurrence on the 6th postoperative week. The histopathological report of this patient revealed a non-specific lesion. She was

offered re-exploration and refused. These results reflect short-term outcomes only.

Figure 4. A 30-year-old female with a glomus tumor in subungual location of the left thumb. (a) Longitudinal ridging with mild medial dystrophy of the nail plate; (b) Tumor excision with transungual approach; (c) Nail plate inserted after complete tumor excision; (d) Histopathological findings: The lesion is composed of multilayered perivascular epithelioid cells that have a sharply punched-out rounded nuclei with amphophilic or pale eosinophilic cytoplasm (H&E, ×400).

4. Discussion

Glomus is a Latin word meaning a "spherical mass" or "ball". Glomus tumors were first reported by Wood [14] in 1812 and, were also known as "painful subcutaneous tubercles." Barre and Masson [15] in 1924 1st demonstrated the histology of glomus tumors, as they arise from deformed smooth muscle cells known as glomus cells present in the wall of Sucquet-Hoyer canal of the normal glomus body. These cells are distributed throughout the entire body, but mostly well developed in the skin, and are also found in the mucous membranes and internal organs such as the lung, stomach, and bone [4]. The glomus body consists of afferent arteriole, primary collecting vein, anastomotic vessel known as Sucquet-Hoyer canal, capsular portion, and intraglomerular reticulum [16]. The glomus body is located in the stratum reticularis of the dermis and highly concentrated in the tips of the digits, especially under the nails and lateral aspects of the digits [8]. Glomus tumors are classified according to clinical presentation as either solitary or multiple. The solitary variant is far more common than the multiple type, painful, and mostly found in the female hand. The multiple variant is usually painless and develops in children due to mutation in the glomulin gene located on chro-

mosome ([1] pp. 21-22) and has an autosomal dominant inheritance pattern [2].

Glomus tumors aren't diagnosed easily, and the patient remains in pain for long periods because of both errors in diagnosis and inappropriate treatments advised such as corticosteroids injections, physiotherapy, vasodilator therapy, laminectomy, carpal tunnel release, and even amputation [17]. We aimed in this study to demonstrate our understanding and experience with the management of glomus tumors of the hand which were analyzed according to their clinical presentation, diagnosis, surgical approach, and outcome.

In the present series, we treated 17 patients clinically diagnosed as having glomus tumors in the hand over a 10-year period, out of which 14 were females and 3 were males. The youngest patient was 25 years, the oldest 59 years, with a mean age of 42.35 years. This middle-aged female predominance coincides with previous studies [2] [4] [9]. The mean duration of symptoms till diagnosis was 2.4 years with a range of 1 - 5 years. The left hand was involved in 10 patients, and the right hand in 7 patients: thumb 6, index finger 2, middle finger 2, ring finger 5, and little finger 2. In a similar study, Santoshi *et al.* [8] retrospectively reviewed the treatment of 37 cases under clinical suspicion of glomus tumors of the fingertips, over a period of ten years. The mean age was 38 years (16 - 62 years), and a female-to-male ratio of 21 to 16. The length of time before treatment ranged from 2 to 12 years (mean: 3.8 years). 22 cases had left-hand involvement. Eight lesions were in the thumb, 5 in the index finger, 5 in the middle finger, 14 in the ring finger, and 5 in the little finger. Subungual region was involved in 33 patients and pulp involvement was in 4 patients. In another study, Garg *et al.* [16] retrospectively reviewed the treatment of 32 subungual glomus tumors in 30 patients, the mean age was 31.13 years (21 - 50 years), and the female to male ratio was 19:11. The mean duration of symptoms before presentation was 9 years (3 - 20 years). Various literatures have demonstrated a relatively long duration from clinical symptoms to diagnosis [6]. Tomak *et al.* [18] found that the mean delay was 7.33 years that could be attributed to misdiagnosis and inappropriate treatment for long periods with nonsteroidal anti-inflammatory drugs to relieve the pain.

In our study, we found that the localized pain and pinpoint tenderness were present in 100% of cases, while cold sensitivity was present in only 58.8% of cases. In addition, 35.3% patients had bluish discolorations of the nails and 17.6% patients had nail deformities. Similarly, Akyurek and Hafiz [13] reported pinpoint pain/tenderness in 100%, cold hypersensitivity in 60%, bluish discoloration of nails in 58% and nail deformities in 42% patients. Also, Lee *et al.* [3] described pinpoint pain/tenderness, cold sensitivity, nail discoloration and nail deformity in 100%, 53%, 18%, and 12% respectively. In another study of 51 subjects with glomus tumors of the hand, Van Geertruyden *et al.* [19] noticed paroxysmal pain in 80%, pinpoint tenderness in 100%, cold sensitivity in 63%, nail deformities in 33% and bluish discoloration of the nails in 29% patients. Several hypotheses have been described regarding the cause of pain in glomus tumors; abundance of mast cells releasing substances, in the glomus tumors, such as histamine, heparin, and 5-

hydroxytryptamine that render the thermal and pressure receptors to be sensitive, excessive dominance of the non-myelinated nerve fibers that terminate within the glomus body has been suggested as a source of pain. Moreover, the presence of capsule of the tumors, which is sensitive to pressure, has been identified as a possible cause of pain.

To aid in the diagnosis, several clinical tests are used commonly, named Love pin test, Hildreth test, and cold sensitivity test. A positive Love test is considered when the subject experienced exquisite, localized pain on applying pressure to the skin overlying the lesion with a pinhead. The Hildreth test is considered positive, when there was reduction of pain and tenderness with the Love test after tourniquet elevation to 250 mmHg, inducing transient ischemia, and return of pain after releasing the cuff. The cold provocation test induces pain in the affected digit when the hand was immersed in cold water or on application of an ice cube to the involved fingertips. In this series, we noticed that the Love test was 100% sensitive and 0% specific, Hildreth test was 75% sensitive and 100% specific, and the cold sensitivity test was 62.5% sensitive and 100% specific. In a similar study, Bhaskaranand and Navadgi [20] treated 18 patients with glomus tumors of the hand and found that the Love test's sensitivity and specificity were 100% and 0% respectively, the Hildreth test's sensitivity and specificity were 75% and 100% respectively, and the cold sensitivity test was 100% sensitive and specific. In a study of 24 cases of glomus tumors of the hand, Giele [21] recorded the specificity and sensitivity of the Hildreth test to be 91% and 92% respectively. Also, Netscher *et al.* [22] found the Love test's sensitivity and specificity were 100% and 0% respectively, the Hildreth test's sensitivity and specificity were 71.4% and 100% respectively, and the cold sensitivity test was 100% sensitive and specific. Despite a combination of these tests is performed to improve diagnostic accuracy, sometimes it is difficult to make the correct diagnosis of the lesion clinically only especially in early glomus tumors in the hand with small size and subungual location.

Radiological imaging studies play a key role not only in case of doubtful diagnosis, but also to delineate the anatomical details of the lesion. Plain radiographs can yield findings like cortical thinning or bone erosion in some cases. We noticed that 70.6% of our patients demonstrated cortical erosion on anteroposterior lateral radiographs. In a similar study, Chou *et al.* [2] found that plain X-ray can show bone erosion in 50% of cases with subungual tumors. Conversely, Van Geertruyden *et al.* [19] identified bone erosions on plain radiographs in only 36% of patients with hand glomus tumors. Ultrasonography (USG)-Doppler can identify the site, size as small as 2 mm, and the shape of the tumor, but is frequently operator dependent. Moreover, the nail plate curvature at the lateral nail folds may create artefacts. It is recommended to use the 10 MHz probe, as small flattened subungual tumors can't easily be detected by the 5 MHz probe. We used color-Doppler sonography in 29.4% patients and reported hypervascular lesions in 17.6% patients. In another study, Akyurek and Hafiz [13] performed ultrasonography (USG)-Doppler for 50% cases with subungual glomus tumors and reported

high-velocity flow in intra-tumoral shunt vessels making these lesions hypervascular in 46.6% cases. Also, Chen *et al.* [23] reported that sonography showed a hypoechoic nodule with prominent vascularity between the dorsal cortex of the distal phalanx and the nail body in all subungual tumors. So, there was no long-term recurrence among all patients due to accurate preoperative ultrasound localization.

Magnetic resonance imaging (MRI) is not invasive and can also detect glomus tumors as small as 2 mm in diameter. A specific characteristic of glomus tumor is seen in MRI as a high signal nidus surrounded by a zone of lower signal intensity. MRI can also be useful in making differential diagnosis from other lesions such as melanoma, hemangioma, pigmented nevus, and neuroma as well as foreign bodies. Moreover, post-contrast gadolinium enhancement helps to differentiate glomus tumors from epithelial inclusion cysts and mucoid cysts. We found that 76.5% of our patients had low signal intensity on T1-weighed images, strong hyperintensity on T2-weighted images, and more enhancement on T1-weighted images after gadolinium injection. We reported a sensitivity of 81.25% for MRI in our series. Al-Qattan *et al.* [24] treated 42 subjects with digital glomus tumors and reported a sensitivity of 90% and +ve predictive value of 97% for MRI in their study. Many studies have demonstrated the high sensitivity of MRI in detecting 82 to 90% of the hand glomus tumors [6] [8] [12]. However, negative MRI results don't rule out the presence of small-sized lesions. Moreover, ultrasound examination may be a better option considering the cost, the time required for the test, and the ability to evaluate the lesion dynamically in real-time.

In literature, the treatment of choice is surgical resection. Early recurrences could be attributed to incomplete excision or to the presence of an undiagnosed lesion during the initial surgery, while delayed recurrences could be attributed to the development of a new glomus tumor, not present during the initial surgery, near the original incision site. Other nonsurgical treatments modalities, such as sclerotherapy and laser have been described [25]. Nevertheless there are no studies large enough to evaluate the efficacy of these therapeutic modalities. Different surgical approaches have been used to extirpate the glomus tumors. However, finding the optimal surgical approach that will reduce the risk of postoperative nail deformity and increase visibility to guarantee total tumor removal and visualize synchronous multiple lesions, could present a challenge. The direct transungual approach is usually recommended as it provides the best exposure, but chances of postoperative split nail deformity are high especially if the nail bed wasn't repaired. The lateral subperiosteal approach is used to prevent postoperative nail bed deformities. However, lesser degrees of exposure and high probability of incomplete lesion excision are the main drawbacks. In our series, transungual excision of the lesions and meticulous closure of the nail bed with 7-0 vicryl sutures were done in 76.5% patients, while lateral subperiosteal approach was done for peripherally located lesions in 23.5% patients. There were no postoperative nail bed deformities observed in our study, while we had a 5.9% recurrence rate. His-

topathologically, 93.1% patients proved to have glomus tumors and only one patient had non-specific fibrotic lesion and had pain recurrence postoperatively.

Chou *et al.* [2] performed transungual resection in 33 patients and reported 4% postoperative nail bed deformity rate and no recurrences. Lee *et al.* [4] used transungual approach in 11 cases, volar approach in 3 cases, and lateral subperiosteal approach in one case. They noticed that all patients had excellent cosmetic results with no recurrences. Vasisht *et al.* [9] recommended the use of the lateral subperiosteal approach in their series of 19 patients. They reported a recurrence rate of 15.7% within 3 years, but no nail bed deformities. Garg *et al.*16 used the nail preserving modified lateral subperiosteal approach, where the lateral incision is curved distally over the pulp tip, achieving a large flap yielding a good exposure of the tumor without any struggle. They noticed that all wounds healed well without any noticeable scar and all patients had no recurrence or nail deformity on follow-up.

As the glomus tumor is a relatively rare lesion so there is a lack of comparable studies to compare our findings in terms of some variables, multiple centers might be required. Moreover, the small sample size, the retrospective nature of the study, the observational nature of the results and the short follow-up period were the limitations of our study. To address this problem, we recommend additional larger prospective trials using operative findings as the reference standard, and prospective randomized studies comparing the outcomes of the lateral subperiosteal approach and the transungual approach, might help to develop a diagnostic algorithm and a decision regarding the ideal operative technique for glomus tumors. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

5. Conclusion

This study demonstrates that for early and accurate diagnosis of glomus tumors of the hand, a comprehensive strategy, utilizing a combination of thorough history taking such as paroxysmal and intense pain with contact pressure or temperature changes, highly sensitive clinical tests such as Love test, Hildreth test and cold sensitivity test, and highly specific imaging tools such as plain radiography and MRI. Once diagnosed, complete surgical excision is the only effective method for treatment, pain relief, and recurrence prevention. For tumors arising in the central region, we recommend a transungual approach followed by meticulous repair of the nail bed; for tumors arising in the peripheral region, we recommend a lateral subperiosteal approach.

Conflicts of Interest

There is no conflict of interests.

References

[1] Remita, K. and Loucif, A. (2022) Subungual Glomus Tumor: Three Triads to Avoid

Delays in Diagnosis. *Algerian Journal of Medical and Health Research*, **1**, 96-102.

[2] Chou, T., Pan, S.C., Shieh, S.J., Lee, J.W., Chiu, H.Y. and Ho, C.L. (2016) Glomus Tumor: Twenty-Year Experience and Literature Review. *Annals of Plastic Surgery*, **76**, S35-S40. https://doi.org/10.1097/sap.0000000000000684

[3] Lee, I.J., Park, D.H., Park, M.C. and Pae, N.S. (2009) Subungual Glomus Tumours of the Hand: Diagnosis and Outcome of the Transungual Approach. *Journal of Hand Surgery* (*European Volume*), **34**, 685-688.

[4] Lee, W., Kwon, S.B., Cho, S.H., Eo, S.R. and Kwon, C. (2015) Glomus Tumor of the Hand. *Archives of Plastic Surgery*, **42**, 295-301. https://doi.org/10.5999/aps.2015.42.3.295

[5] Moon, E.S., Choi, M.S., Kim, M.S., Kong, I.K. and Kim, B.J. (2009) Distribution of Glomus Tumors in Fingers. *Journal of the Korean Society for Surgery of the Hand*, **14**, 138-143.

[6] CR, P., N, S. and B, T. (2017) Subungual Glomus Tumours: Is Magnetic Resonance Imaging or Ultrasound Necessary for Diagnosis? *Malaysian Orthopaedic Journal*, **11**, 47-51. https://doi.org/10.5704/moj.1703.020

[7] Morey, V.M., Garg, B. and Kotwal, P.P. (2016) Glomus Tumours of the Hand: Review of Literature. *Journal of Clinical Orthopaedics and Trauma*, **7**, 286-291. https://doi.org/10.1016/j.jcot.2016.04.006

[8] Santoshi, J.A., Kori, V.K. and Khurana, U. (2019) Glomus Tumor of the Fingertips: A Frequently Missed Diagnosis. *Journal of Family Medicine and Primary Care*, **8**, 904-908.

[9] Vasisht, B., Watson, H.K., Joseph, E. and Lionelli, G.T. (2004) Digital Glomus Tumors: A 29-Year Experience with a Lateral Subperiosteal Approach. *Plastic and Reconstructive Surgery*, **114**, 1486-1489. https://doi.org/10.1097/01.prs.0000138752.36175.d5

[10] McDermott, E.M. and Weiss, A.C. (2006) Glomus Tumors. *The Journal of Hand Surgery*, **31**, 1397-1400. https://doi.org/10.1016/j.jhsa.2006.05.018

[11] Kwon, S.T. and Jeong, E.C. (2009) Subungual Glomus Tumor Resection with Partial Detachment of nail Plate. *Journal of the Korean Society for Surgery of the Hand*, **14**, 210-214.

[12] Baek, H.J., Lee, S.J., Cho, K.H., Choo, H.J., Lee, S.M., Lee, Y.H., *et al.* (2010) Subungual Tumors: Clinicopathologic Correlation with US and MR Imaging Findings. *RadioGraphics*, **30**, 1621-1636. https://doi.org/10.1148/rg.306105514

[13] Akyurek, M. and Hafiz, G. (2023) Retrospective Analysis of Clinical Findings and Radiologic Diagnostic Methods of Subungual Glomus Tumor: A Single-Center Study. *European Journal of Plastic Surgery*, **46**, 1247-1253. https://doi.org/10.1007/s00238-023-02123-8

[14] William Wood, E. (1812) On Painful Subcutaneous Tubercle. *Edinburgh Medical and Surgical Journal*, **8**, 283-291.

[15] Barre, J.A. and Masson, P.V. (1924) Anatomy-Clinical Study of Certain Painful Subungual Tumors (Tumors of Neuromyo-Arterial Glomus of the Extremities). *Bulletin de la Société Française de Dermatologie et de Syphiligraphie*, **31**, 148-159.

[16] Garg, B., Machhindra, M.V., Tiwari, V., Shankar, V. and Kotwal, P. (2015) Nail-Preserving Modified Lateral Subperiosteal Approach for Subungual Glomus Tumour: A Novel Surgical Approach. *Musculoskeletal Surgery*, **100**, 43-48. https://doi.org/10.1007/s12306-015-0374-z

[17] Shin, D., Kim, M., Kim, S. and Kim, S. (2010) A Painful Glomus Tumor on the Pulp

of the Distal Phalanx. *Journal of Korean Neurosurgical Society*, **48**, 185-187. https://doi.org/10.3340/jkns.2010.48.2.185

[18] Tomak, Y., Akcay, I., Dabak, N. and Eroglu, L. (2003) Subungual Glomus Tumours of the Hand: Diagnosis and Treatment of 14 Cases. *Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery*, **37**, 121-124.

[19] Van Geertruyden, J., Lorea, P., Goldschmidt, D., De Fontaine, S., Schuind, F., Kinnen, L. and Moermans, J.P. (1996) Glomus Tumours of the Hand: A Retrospective Study of 51 Cases. *Journal of Hand Surgery*, **21**, 257-260.

[20] Bhaskaranand, K. and Navadgi, B.C. (2002) Glomus Tumour of the Hand. *Journal of Hand Surgery*, **27**, 229-231. https://doi.org/10.1054/jhsb.2001.0746

[21] Giele, H. (2002) Hildreth's Test Is a Reliable Clinical Sign for the Diagnosis of Glomus Tumours. *Journal of Hand Surgery*, **27**, 157-158. https://doi.org/10.1054/jhsb.2001.0724

[22] Netscher, D.T., Aburto, J. and Koepplinger, M. (2012) Subungual Glomus Tumor. *Journal of Hand Surgery*, **37**, 821-823.

[23] Chen, S.H.T., Chen, Y.L., Cheng, M.H., Yeow, K.M., Chen, H.C. and Wei, F.C. (2003) The Use of Ultrasonography in Preoperative Localization of Digital Glomus Tumors. *Plastic and Reconstructive Surgery*, **112**, 115-119.

[24] Al-Qattan, M.M., Al-Namla, A., Al-Thunayan, A., Al-Subhi, F. and El-Shayeb, A.F. (2005) Magnetic Resonance Imaging in the Diagnosis of Glomus Tumours of the Hand. *Journal of Hand Surgery*, **30**, 535-540. https://doi.org/10.1016/j.jhsb.2005.06.009

[25] Gombos, Z. and Zhang, P.J. (2008) Glomus Tumor. *Archives of Pathology & Laboratory Medicine*, **132**, 1448-1452. https://doi.org/10.5858/2008-132-1448-gt