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ORIGINAL ARTICLE

Fingernail Preservation in Trans-ungual Excision of Subungual Glomus Tumor

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ABSTRACT

Background: Glomus body tumor is a form of benign neuromyoarterial tumor typically determined in fingers, especially in subungual locations, this tumor is usually removed most effectively by surgical operation. This study aimed to assess the trans-ungual removal of subungual glomus tumors to avoid a postoperative fingernail deformity and a recurrence of subungual glomus body tumors .

The design of this study is retrospective cohort study and our objective is to evaluate the clinical and radiological results of fingernail preservation in trans-ungual excision of subungual Glomus.

Methods: This study included 15 patients who underwent trans-ungual surgical microscopic or Loupe magnification to gain micro excision to prevent recurrence and prevent postoperative nail deformity, with follow-up for three years between 2020-2023. Pinpoint pain, cold intolerance, nail discoloration, and deformity all complications were recorded before and after surgery. The diagnosis of glomus was confirmed after histopathology of the excisional biopsy.

Results: All of our patients had pinpoint pain, and tenderness, with significant cold intolerance, 12 patients (80%) had obvious nail discoloration, 5 patients (33.33%) had obvious dystrophic changes and three patients (20%) had recurrent glomus tumors. The tumors after microdissection from surrounding tissues usually had an ovoid appearance about 2–10 mm in size**.** In all our patients, the pain and cold intolerance were declined. The mean follow-up time was 20.13 months, without any tumor recurrences and improvement of the nail shape. None of our patients had postoperative significant nail deformity.

Conclusion: Surgical resection for the glomus body tumors via a trans-ungual technique and approach resulted in complete symptom relief with no recurrences and no nail deformity.

Keywords: The glomus body tumor, Hand tumor, Nail deformity, Subungual tumor, Trans-ungual approach.

INTRODUCTION

The Glomus body **Figure (1)** is a normal body structure located in the stratum reticulare corii with a diameter usually less than 10 mm. The Glomus body is highly vascular and specialized anastomotic channels that connect the terminal tiny arteriole with a primary tiny venule. The feeding efferent arteriole distributes into a complex tortuous chain of anastomotic tiny vessels that are lined with endothelium and two ill-differentiated muscular layers. The clear type of epithelioid cells has oval nuclei so they are called the glomal cells and are situated among the muscle cells these glomal cells are closely related to pericytes, which these normally situated at intervals on the outer surface of the blood capillaries. The Glomus body is usually surrounded by a clear fibrous tissue capsule which is richly innervated with the sympathetic part of nerve fibers endings [1,3].

The glomus body regulates the temperature of the peripheral tissues as it controls the amount of peripheral blood supply flow and peripheral pressure of blood [4].

The subungual glomus body tumor is a type of benign tumor, that is rare, arises from the glomus body, and has special symptoms like localized pinpoint tenderness, nail dystrophy and discoloration **Figure (4 A, B)**, and cold

intolerance. [3,4] Special examination helps us diagnose and accurately localize this subungual glomus body tumor, such as Love's pin test (localized pressure on the examined finger over the tumor by the head of an examination pin and so patient has severe degree of tenderness), Hildreth's test (the application of a tourniquet around the base of the painful finger this will lead to pain reduction), Also test of Cold sensitivity (put the affected limb into the cold water this will lead to severe pain around the suspected lesion) [5,6].

Usually, diagnosis in patients with subungual glomus body tumors is frequently delayed or missed due to a lack of orientation with this tumor. This glomus body tumor must be taken into consideration during the differentiation of any painful lesion either subcutaneous or subungual [3]

This study aimed to assess the trans-ungual removal of subungual glomus tumor to avoid a postoperative fingernail deformity and a recurrence of subungual glomus body tumors.

The hypothesis of this study that the transungual technique that preserves the nail bed has multiple benefits, including quicker tumor excision due to better exposure of the nail bed and less damage to the nail bed and deformation of the nail.

METHODS

The number of patients in our study was 15 patients with hand glomus body tumors, the diagnosis was confirmed after histopathology results, follow-up period was between 2020 to 2023. All of our patients presented complaining of severe pinpoint pain (Love's pin test) and were diagnosed using the cube of ice test (the cold sensitivity test) and Hildreth's test, underwent trans-ungual surgical microscopic or Loupe magnification to gain micro excision to prevent recurrence and prevent postoperative nail deformity at Orthopedic department, Faculty of Medicine, Zagazig University.

The research ethics board of the Faculty of Medicine at Zagazig University gave its approval to the study, and all participants gave written informed consent. A component of the Code of Ethics for Research Involving Humans, the Declaration of Helsinki ensures that the study was carried out in compliance with its provisions. Before this study could begin, we obtained approval from the Institutional Review Board (IRB#776/27-10-2024).

We included all cases from both sexes who had hand subungual glomus body tumors, the diagnosis was confirmed after histopathology results who presented complaining of severe pinpoint pain (Love's pin test) and were diagnosed using the cube of ice test (the cold sensitivity test) and Hildreth's test.

We excluded all patients who had any of the following characteristics: Patients having local infection or generalized neuropathic diseases.

Detailed history, with special stress on nail plate deformity, and the patient exhibited severe pinpoint tenderness. Investigations as X-ray was done, two patients were found to have abnormal findings, including bone erosion **Figure (3 A, B)**. Magnetic resonance imaging (MRI) was performed also in all of our cases to confirm the diagnosis **Figure (4 A, B)**.

The surgical procedures were carried out with a digital local ring anesthesia 3.5 magnification loupe, and a tourniquet control (digital or forearm). Because the position of the tumor could become confused after anesthesia, it was outlined before anesthesia.

In 12 cases, a standard trans-ungual approach **Figure (2 A)**, and in three cases where tumors were recurrent the lateral subperiosteal approach **Figure (2B)** was used, through which the incision of surgery was done in the lower part of the lateral side in the fingernail fold and also the nail bed was elevated to remove this tumor. In the trans-ungual approach, a periosteal stripping elevator was used to separate the fingernail and the nail bed. The fingernail was then lifted from the nailbed, and it was folded (**Figure (5A**), exploration of the tumor that infested the fingernail bed. The fingernail was removed carefully to protect the fingernail bed **Figure (5 B, C)**, and a well-defined tumor was discovered. The tumor was carefully detached and removed **Figure (5C)** after longitudinal incision of the nail bed, curettage of the underlying bone, and ablation of the nerve endings with bipolar diathermy ,Vicryl 7/0 absorbable suture was used for the primary suture of the fingernail plate **Figure (6)**, then the nail was put in its site after being closed with Vicryl 4/0 **Figure (7)**.

After the procedure, the patient has been monitored in an outpatient setting for 3 years. The patient's pain and all other previously reported symptoms were subsided. The patient's pain was assessed using the visual analogue scale (VAS) pain before surgery and after the procedure. Love's test and the Ice cube tests were done.

Statistical Analysis

All data were gathered, tabulated, and statistically assessed employing Microsoft Office Excel 2010 and SPSS 22.0 for Windows. Continuous data were expressed as mean ± SD and median (range), whereas categorical variables were expressed as a percentage. The Wilcoxon signed ranks test was

utilized to compare two dependent groups with non-normally distributed data. The McNemar test was applied to compare matched categorical data. All tests were two-sided. A p-value of <0.05 was considered statistically significant.

RESULTS

This study included 15 participants with an average age of 32.73 years (standard deviation 9.20). The sample is comprised of 60% males and 40% females. Two-thirds of the participants experienced pain in their right hand, while the remaining one-third experienced pain in their left. Dominant hand involvement was present in 60% of the participants. The occupations represented in the sample included drivers, electricians, housewives, mechanics, nurses, teachers, engineers, and students. The average duration of pain was 2.87 years (standard deviation 1.19). The middle and ring fingers were the most affected fingers, followed by the index and thumb. The median preoperative visual analog scale (VAS) score was 8, with an interquartile range of 7-9. Nail dystrophy was present in 33.33% of the participants, while nail coloration was present in 80% (Table 1).

All the excised glomus tumors were about (2-10) mm in size and ovoid or round in shape. Within a capsule thus clearly separated from surrounding tissues. During the follow-up period, no recurrences nor other complications, like postoperative nail dystrophic changes and deformity **Figure (8)**, were observed in any one of the patients. As regards histopathology, the glomus tumors were all covered with relatively obvious fibrous thin capsules with single or multiple layers, epithelioid cells have regular rounded shapes that are surrounded by tortuous dilated with thin-walled small blood vessels. Epithelioid cells with round nuclei and no mitotic figures were observed in a high-power field magnification.

Love's test and the Ice cube test both were negative in all patients, with VAS Score Median preoperative 8 (from 7 to 9) and VAS Median postoperative 0 (0-0). The average follow-up time was 22.67 months, during which no detected recurrences and nail dystrophic changes 5 (33.33 %), and zero (zero %) preoperative and postoperative respectively and discoloration improved (Fig.8). There were no postoperative nail deformities (Tables 2,3).

Table 1: Baseline characteristics of the patients

Variable	Levels	N=15
Age	Mean (SD)	32.73 (9.20)
Sex N (%)	Male	9 (60 %)
	Female	6 (40 %)
Side N (%)	Right	10 (66.67 %)
	Left	5 (33.33 %)
Dominant N (%)	Dominant	9 (60 %)
	Non-dominant	6 (40 %)
Occupation N (%)	Driver	3 (20.00 %)
	Electrician	2 (13.33 %)
	Housewife	2 (13.33 %)
	Mechanics	2 (13.33 %)
	Nurse	2 (13.33 %)
	Teacher	2 (13.33 %)
	Engineer	1 (6.67 %)
	Student	1 (6.67 %)
Duration of Pain in Years	Mean (SD)	2.87 (1.19)
Affected Finger N (%)	Middle	5 (33.33)
	Ring	5 (33.33)
	Index	3 (20.00)
	Thumb	2 (13.33)
Preoperative VAS Score	Median (IQR)	8 (7-9)
Preoperative Nail Dystrophy N (%)	No	10 (66.67 %)
	Yes	5 (33.33 %)
Preoperative Nail Coloration N (%)	No	3 (20 %)
	Yes	12 (80 %)

Table 2: Postoperative assessment of the patients

Variable	Levels	N=15
Postoperative VAS Score	Median (IQR)	0 (0-0)
Postoperative Nail Dystrophy N (%)	No	15 (100 %)
	Yes	0 (0 %)
Postoperative Nail Coloration N (%)	No	15 (100 %)
	Yes	0 (0 %)
Follow up Period in Months	Mean (SD)	22.67 (5.97)

Table 3: Postoperative changes in patients' assessment

Variable	Levels	Preoperative	Postoperative	*P-value*
VAS Score	Median (IQR)	8 (7-9)	0 (0-0)	**< 0.001 #**
Nail Dystrophy N (%)	No	10 (66.67 %)	15 (100 %)	0.073 †
	Yes	5 (33.33 %)	0 (0 %)	
Nail Coloration N (%)	No	3 (20 %)	15 (100 %)	**0.001** †
	Yes	12 (80 %)	0 (0 %)	
# Wilcoxon Signed-Rank Test; P-value significant at < 0.05. † McNemar Test; P-value significant at < 0.05.				

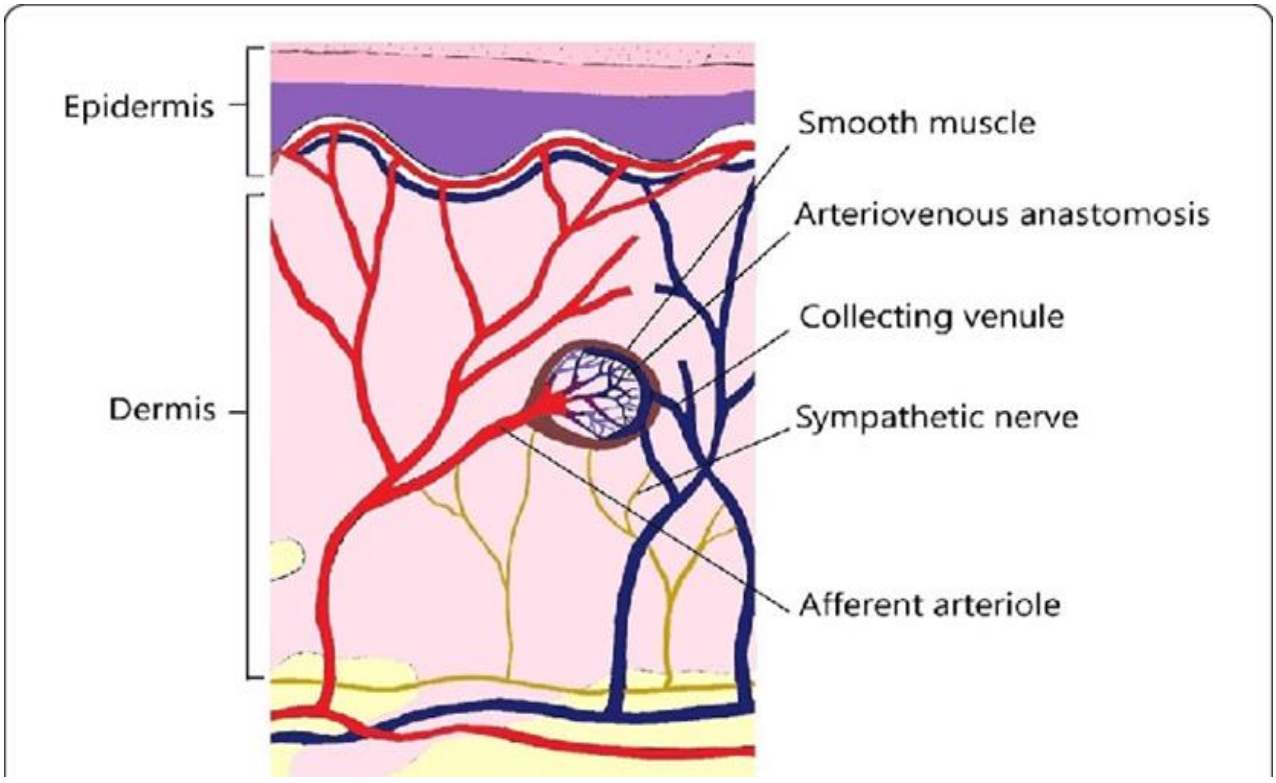


Figure 1: A schematic illustration view of the glomus body in the dermal layer of skin. (2,3)

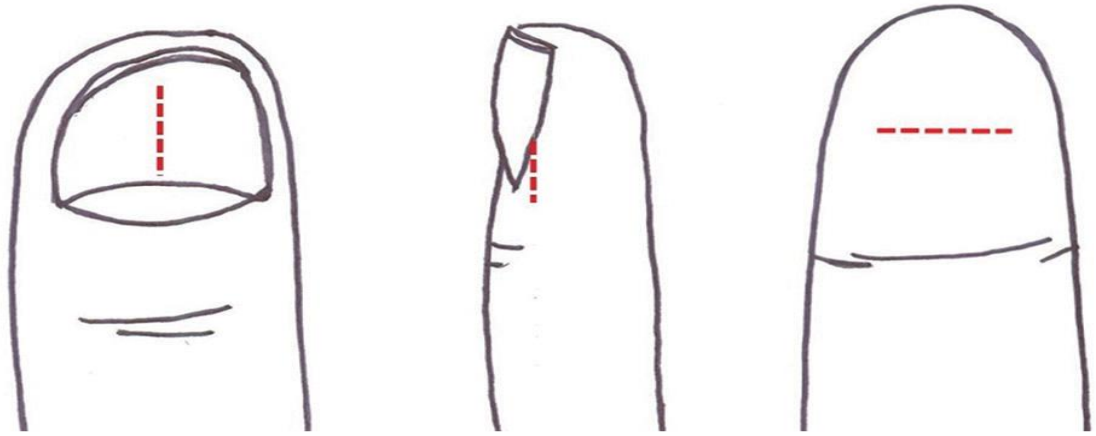


Figure 2: Different lines in surgical approach
A) Trans-ungual classic approach. (B) lateral and subperiosteal approach. (C) Volar finger pulp approach.

Figure (3 A, B) X-ray anteroposterior and lateral views of a male patient 33 years showing subungual glomus tumor with bone erosion of glomus tumor at a distal phalanx of the middle finger

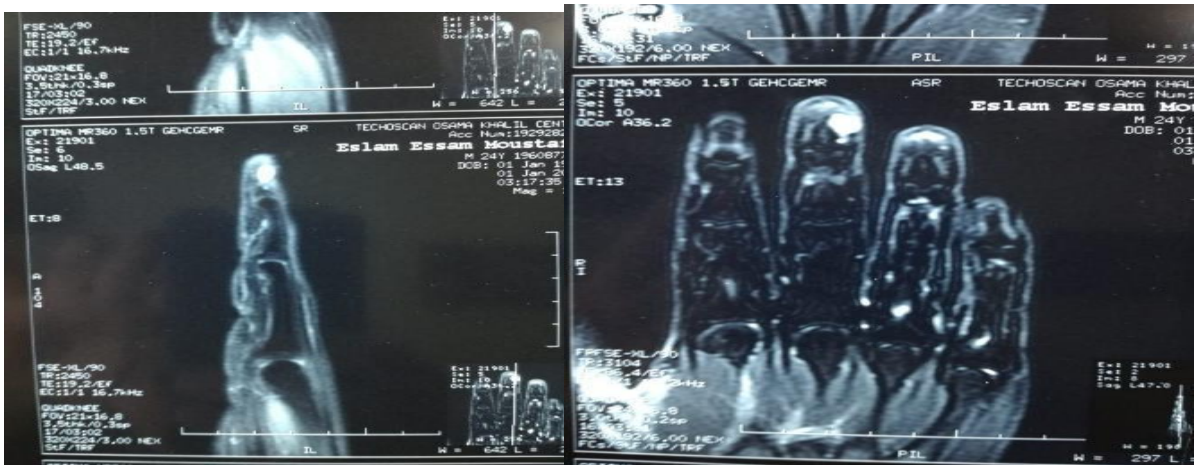
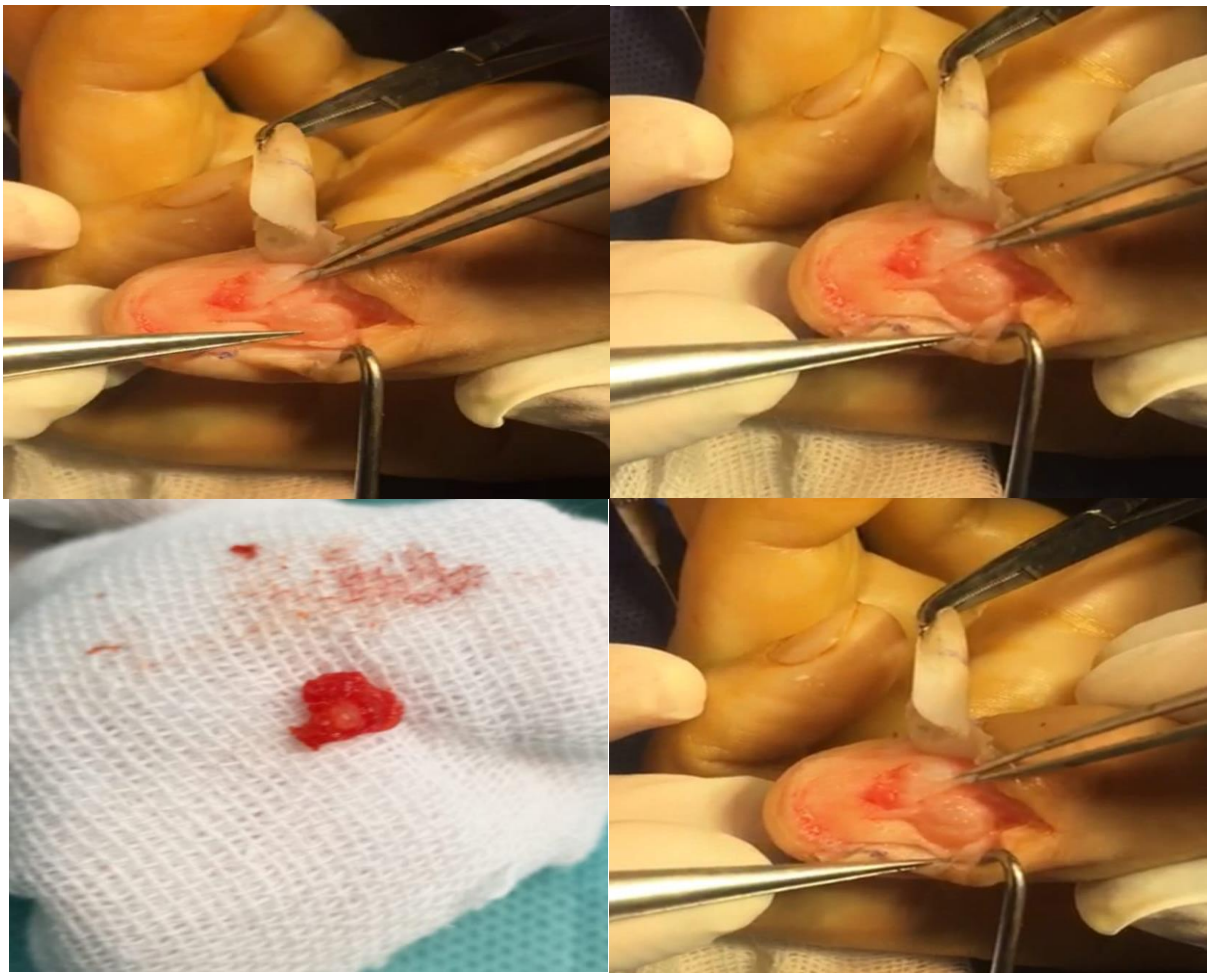


Figure (4 A, B) MRI hand of a male patient 33 years old showing bone erosion of glomus tumor at a distal phalanx of the middle finger showing glomus tumor middle finger.

Figure (4 A, B): Preoperative nail discoloration in two patients showing central and peripheral glomus tumors



(5A, B, C, D): Thumb subungual glomus tumor in a male patient 35 years old showing Intraoperative surgical steps of hard nail elevation then nail plate longitudinal incision, localization, and excision of the tumor, and lastly the glomus tumor mass after complete removal before being sent to histopathology.

Figure 6: Nail bed plate repair with 7/0 Vickryl suture in a male patient 29 years old with a peripherally located glomus tumor with proximal extension necessitating proximal skin incision.

Figure 7: Final position after nail repositioning and suture in a male patient 29 years old with a peripherally located glomus tumor with proximal extension necessitating proximal skin incision.

Figure 8: Follow-up subungual glomus tumor after 2 years with no nail deformity or discoloration in a male patient 42 years old after removal of a glomus tumor in the left index finger.

DISCUSSION

In our technique for trans-ungual excision Treatment of subungual Glomus tumor with the use of magnification Loup which is better regarding the preservation of nail bed and complete excision which prevents recurrence of the tumor in comparison to the old traditional surgical intervention; it is more likely that the nail matrix will be damaged .our surgical technique is extensile and allow the surgical field to be expanded in order to achieve full removal which is different from Lateral Subperiosteal Approach Proposed by **Bhupesh** and colleagues[14]., this method allows access to the subungual tumor without splitting the nail bed, thus eliminating the need for nail bed repair. Also different from the Modified Periungual Approach (2007) developed by Fong and colleagues [15]., this technique similarly avoids splitting the nail bed but is only applicable for tumors at the marginal subungual region. Both methods, while beneficial in reducing nail bed damage, demand greater surgical skill and time compared to the direct splitting approach.

Eliminating a glomus tumor while protecting the nail bed is of utmost importance. A proper exposure is achieved by removing the nail plate in part or in its entirety; however, this process might cause the nail bed to be damaged and the normal regrowth of the nail to take longer than expected. But several authors have demonstrated success with a trans-ungual method like in our study [4].

For the glomus tumors located beneath the nails, the trans-ungual approach is a common treatment option. Although this approach allows good exposure of the glomus tumor, it can lead to cosmetically unsatisfactory outcomes like if the nail bed is severely damaged during removal and excision of the tumors or careless repair of the fingernail bed, which causes postoperative nail dystrophic deformity[٩,١٠] .

Lee et al. [11] described the modification of the trans-ungual approach and technique for excision and removal of subungual glomus body tumors to decrease too much manipulation in surgery of this fingernail plate and bed, but the rate recurrence of symptomatic pain and also incomplete pain remission was high in some patients so this technique was so limited and so required more additional research .

In our study, we used the proper nail cover for protection of the nail bed till normal healing and to

avoid nail deformity which is different from the synthetic nail protector used In **M. ElSherif, M. Abonnour** et al [1], they used the trans-ungual approach that allows a complete glomus tumor excision and they used synthetic nail protective shield like for fingernail bed using the surgical suture packet cover, which provides a lower cost method for protecting the bed of the fingernails.

Regarding the recurrence in our study, we have no cases of glomus tumor recurrence in short-term follow-up to 4 years Love's and the Ice Cube tests had been turned negative for all of our study patients, and there was no recurrence rate of any symptoms in the duration time of the follow-up, which looks like the findings of Ekin et al. [12], Hamdi et. al and Moon et al. [13] Although, Song et. al. recorded recurrence rate of near 5%, Moon et al. [7] and Tomak et. al. [10] both recorded a rate of recurrence about 7.1% .

The modified method for excising subungual glomus tumors, as mentioned, offers several advantages including simplicity and effectiveness: The method is straightforward, making it easier to perform while still being effective in removing the tumor. Low Recurrence Rate: This technique reportedly achieves a low rate of tumor recurrence, which is crucial for long-term patient outcomes. Reduced Postoperative Pain: by avoiding nail extraction, patients typically experience less postoperative pain, improving recovery. The weak point in this study is a limited number of cases and short time of follow-up some cases are lost during follow-up and lack of comparison with other techniques.

In the future, it is recommended to extend the number of cases (but unfortunately the glomus tumor is a rare condition and common to be misdiagnosed) and make comparison studies with other techniques.

Conclusions

Surgical resection for the glomus body tumors via a trans-ungual technique and approach resulted in complete symptom relief with no recurrences and no nail deformity.

Conflict of Interest: None

Financial Disclosures: None

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