Received: 20 January 2024 | Revised: 8 April 2024 | Accepted: 1 May 2024

DOI: 10.1002/ccr3.8907

CASE REPORT

Clinical Case Reports Open Access WILEY

Relationship between dermoscopic and histopathological findings of extradigital glomus tumors

Tomoaki Takada

Sumikawa Takada Dermatology Clinic, Sapporo, Hokkaido, Japan

Correspondence
Tomoaki Takada, Dermatology, Sumikawa Takada Dermatology Clinic, 11-10 Sumikawa-4-chome, Minami-ku-6-jo Sapporo, Hokkaido 005-0006, Japan.
Email: tomoaki@gg.em-net.ne.jp

Key Clinical Massage

In extradigital glomus tumors, (1) noncontact and (2) contact dermoscopy show (1) a central purplish-white area corresponding to tumor nests surrounding enlarged vessels, a peripheral yellow-white area corresponding to mucin deposition, melanin granules, and fibrous tissue, and (2) white reticular and linear cord areas corresponding to pseudocapsules and collagen fibers.

KEYWORDS

back, dermatopathology, dermoscopy, glomus tumor, pseudocapsule

1 | INTRODUCTION

Glomus tumors are commonly found beneath the fingernails but can also manifest in many other locations. Many of these tumors are associated with paroxysmal pain and are characterized by the proliferation of epithelioid cells near blood vessels. Histologically, glomus tumors can be classified into several varieties based on clinical features.[1] Glomus tumors constitute <2.0% of all primary soft tissue tumors, with approximately 80% of the lesions located in the upper extremity and >75% located subungually.[2,3] Digital glomus tumors allow for clinical diagnosis in approximately 90% of cases, while only 20% of extradigital glomus tumors are diagnosed correctly by the initial physician.[3] A little is known regarding their clinical and dermoscopic features. In this report, we present a case of an extradigital solitary glomus tumor located on the back with dermoscopic features and histopathological correlations.

This study aimed to examine the relationship between dermoscopic and pathological findings in extradigital glomus tumors, thereby enhancing awareness of this tumor.

2 | CASE HISTORY/EXAMINATION

A 78-year-old man presented to our clinic with a 10-year history of a slow-growing painful nodular lesion on the back. He reported worsening pain with pressure exposure, with no cold intolerance or hypersensitivity. Physical examination revealed a well-defined, smooth, dome-shaped, whitish-purple nodule measuring 15 mm in diameter (Figure 1). Polarized noncontact dermoscopy revealed irregular, structureless, purpuric macules scattered throughout the tumor, covered with white reticular macules and white lines. The background appeared dark red with no discernible structure. Margins showed a well-demarcated white-to-yellow ring. Additionally, the tumor's reticular white spot was yellowish (Figure 2A). Polarized, contact dermoscopy-induced fibrous white linear structures were continuously observed in the compressed margin from the tumor protuberance. The skin surface of the tumor protuberance showed a ring-like yellowness (Figure 2B).

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.
© 2024 The Authors. *Clinical Case Reports* published by John Wiley & Sons Ltd.

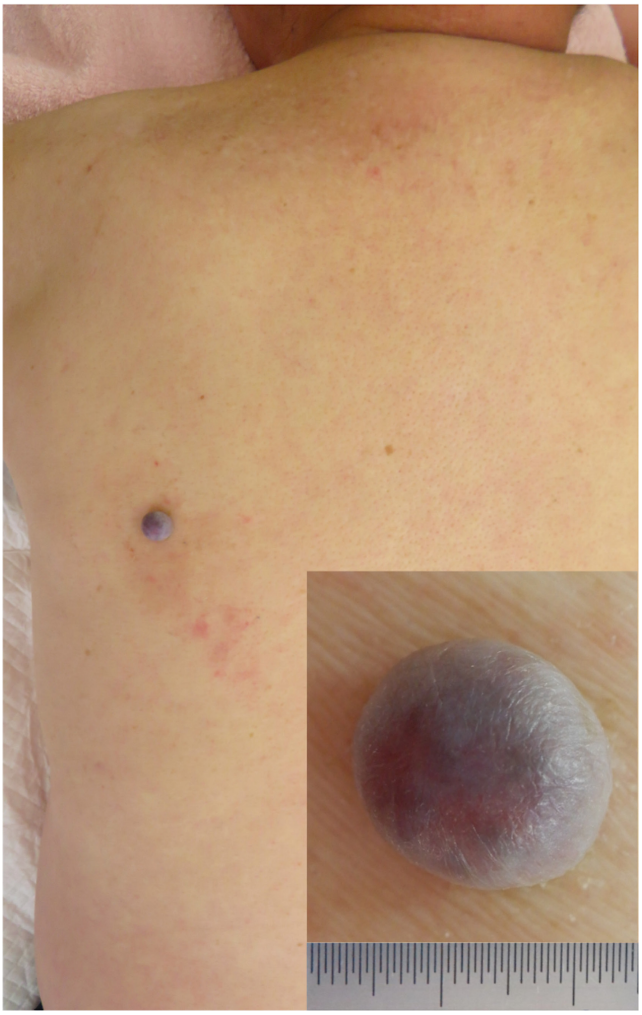

FIGURE 1 Clinical presentation findings. A well-defined whitish-purplish papule with a scaly surface is shown on the left scapular region of the back (inset image).

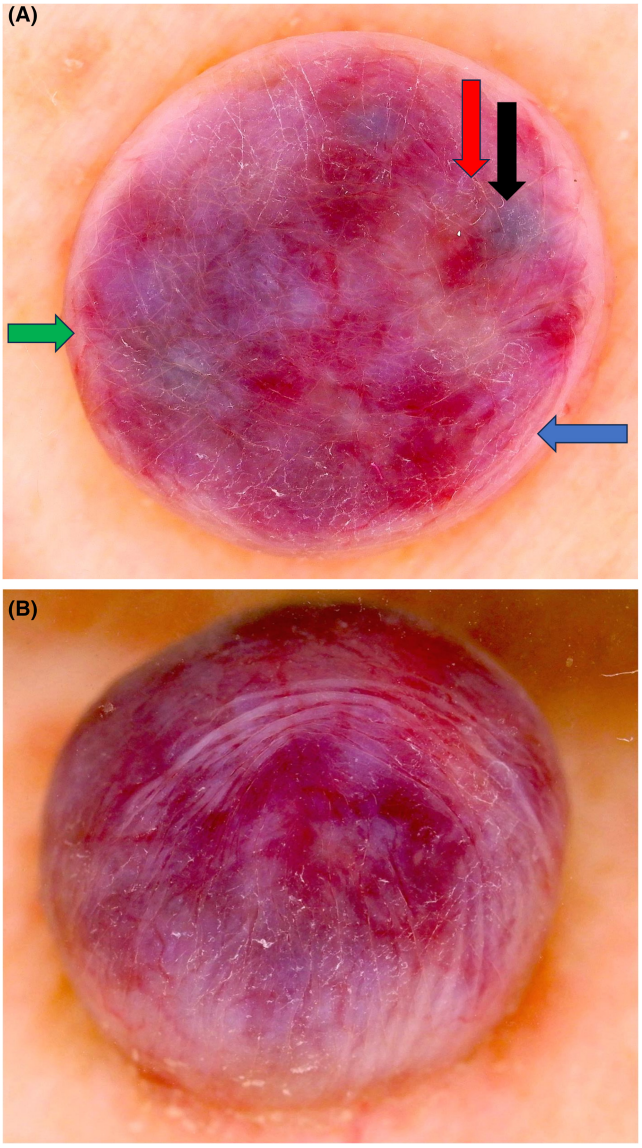

FIGURE 2 Dermoscopic findings. (A) Polarized, non-contact dermoscopy revealed the following: Several unstructured purple regions (black arrow) are observable to be independently present, accompanied by reticulate white spots (red arrow). Some of the reticular patches exhibit a yellowish color with white lineation. The tumor's margins are encapsulated by a white to yellowish banded ring (blue arrow) with some visible capillaries (Green arrow). The entire tumor presents a reddish background. The skin of the tumor ridge displayed a yellowish-to-pale orange tone. (B) Polarized contact dermoscopy helped visualize thick connective tissue-like white fibers encapsulating the tumor.

3 | DIFFERENTIAL DIAGNOSIS, INVESTIGATIONS, AND TREATMENT

Surgical excision was performed to diagnose and treat the lesion. Pathological examination revealed a tumor enveloped by a CD34-positive fibrous capsule (Figure 5) with vascular spaces surrounded by uniform tumor cells with indistinct borders, eosinophilic cytoplasm, round nuclei, and bland chromatin. Immunohistochemistry (IHC) for smooth muscle actin (SMA) indicated both cytoplasmic and membrane positivity. The stroma where the tumor cells proliferated exhibited a mucous-like appearance (Figure 3). Collagenous fiber hyperplasia is observed from the papillary dermis to the reticular dermis, and elastic fibers are seen to encapsulate the tumor (Figure 4). Alcian blue staining for mucin deposition revealed that all layers of the dermis were stained, with strong staining observed in parts of the interior of the tumor body and papillary dermis at the tumor margins (Figure 6). The epidermis appeared flattened, and melanin granule enhancement was limited to the basal cell layer. Pigmentation was observed in the localized area of the dermis or tumor, with no evidence at other sites (Figure 7). Immunoperoxidase

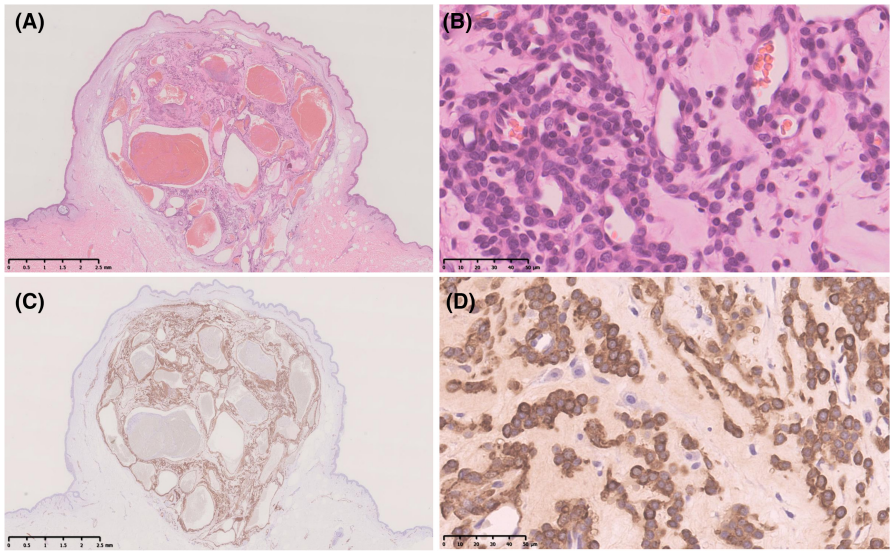

FIGURE 3 Hematoxylin–eosin (HE) staining and smooth muscle Actin (SMA) stains. (A, B) A well-defined nodular lesion is present from the dermal to the fatty layer. A fibrous capsule borders the lesion, and within the lesion, there is an irregularly sized vascular lumen with a single layer of endothelial cells. Outside the vascular lumen, there is a uniform proliferation of cells with small round nuclei and acidophilic cytoplasm (glomus cells). The stroma in which the tumor cells are proliferating exhibits a mucous-like appearance (C, D). Immunohistochemistry (IHC) for SMA shows both cytoplasmic and membranous positivity. (A. HE stains. Original magnification, ×10; scale bar, 2.5 mm). (B. HE stains. Original magnification, ×400; scale bar, 50 μm). (C.SMA stain. Original magnification, ×10; scale bar, 2.5 mm). (D. SMA stain. Original magnification, ×400; scale bar, 50 μm).

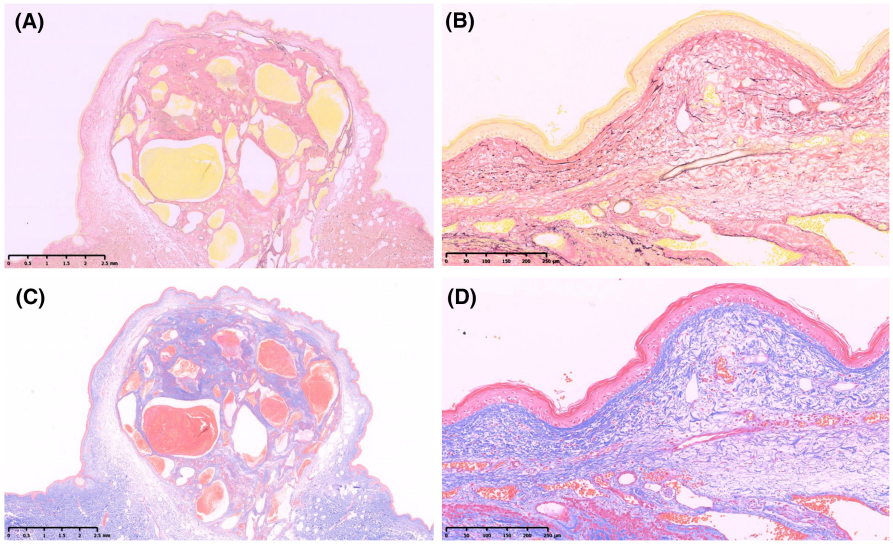

FIGURE 4 Elastica van Gieson (EVG) and Masson-Trichrome staining. Collagenous fiber hyperplasia is observed from the papillary dermis to the reticular dermis, and elastic fibers are seen to encapsulate the tumor. (A, B) Elastic fibers, collagen fibers, myofibers/cytoplasm, and cell nuclei are stained black, red, yellow, and black, respectively. (C, D) Elastic fibers, collagen fibers /reticular fibers, myofibers, cytoplasm, cell nuclei, and erythrocytes are stained light red, blue, red, light red, black, and orange, respectively. (A. EVG stain. Original magnification: ×10; Scale bar, 2.5 mm). (B. EVG stain. Original magnification, ×100; scale bar: 250 μm). (C. Masson-Trichrome stain. Original magnification, ×10; scale bar, 2.5 mm). (D. Masson-Trichrome stain. Original magnification, ×100; scale bar, 250 μm).

staining of the tumor cells was positive for smooth muscle actin (SMA), vimentin, Bcl-2, and S 100, while negative for desmin, cytokeratin (AE1/AE3), EMA, factor 13a, CD31, and CD34.

4 | OUTCOME AND FOLLOW-UP

Pathological examination confirmed the presence of a glomus tumor. The excision was followed by the immediate

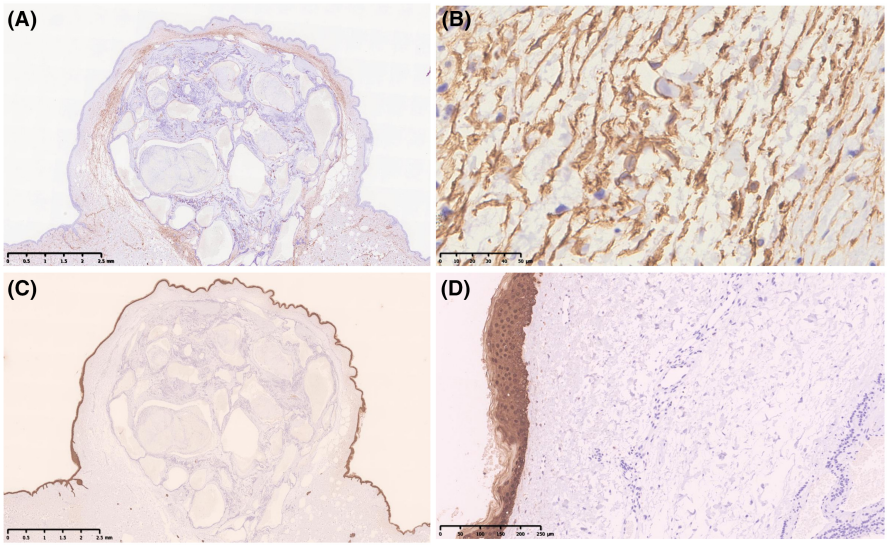

FIGURE 5 CD34 and AE1/AE3. (A, B) Brown staining of a solitary fibrous tumor (CD31 negative) in a banded ring in the dermal reticular formation, other than vascular endothelial cells. (A. CD34 stain. Original magnification, ×10; scale bar, 2.5 mm). (B. CD34 stain. Original magnification, ×100; scale bar, 250 μm). (C, D) All epithelial cells are stained brown and observable within the epidermis. (C. AE1/AE3 stain. Original magnification, ×10; scale bar, 2.5 mm). (D. AE1/AE3 stain. Original magnification, ×100; scale bar, 250 μm).

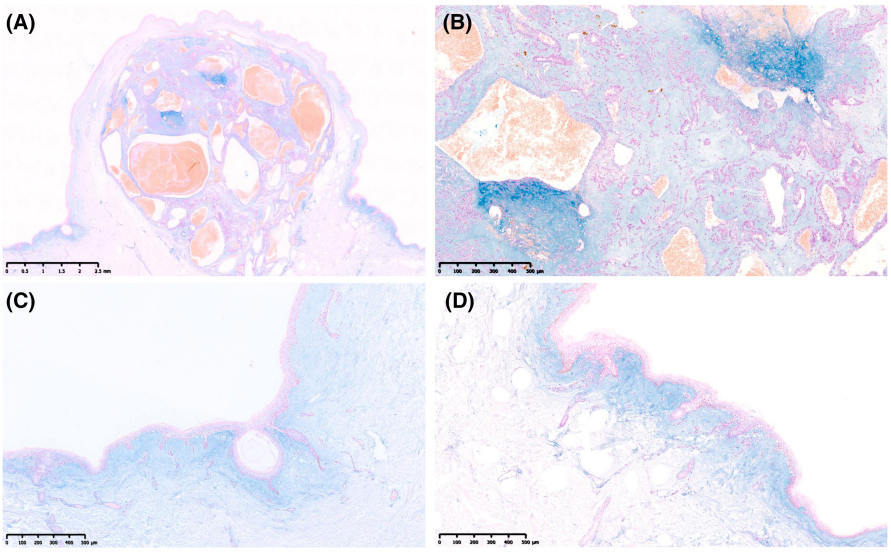

FIGURE 6 Alcian blue staining. Mucin deposition is observable in blue. (A) All dermis layers are stained, but in (B) and (C, D), part of the interior of the tumor body and the papillary dermis at the tumor margins are strongly stained, respectively. (A: Alcian blue stain. Original magnification, ×10; scale bar, 2.5 mm). (B,C, D: Alcian blue stain. Original magnification, ×40; scale bar, 500 μm).

alleviation of pain. Subsequently, there was no evidence of recurrence during 1 year of follow-up.

5 | DISCUSSION

Glomus tumors were first described by Wood in 1812, who observed a slow-growing, bluish, small, benign subcutaneous nodule with acute intermittent spastic pain and tenderness. A microscopic explanation of this tumor was reported 112 years later, acknowledging its origin in the glomus. The first documented case of a glomus tumor in the United States was reported by Mason and Weil.[4–7] According to an analysis of 271 recorded cases,[8] glomus tumors are generally single, with only 14 cases in this study presenting multiple lesions (>5%). Among these, 10 cases occurred in male patients and four in female patients. Multiple nodules are typically identified within a population and have been reported in different parts of the body. The maximum number of nodules in one patient was 48. While glomus tumors are more prevalent in women than in men, the incidence rates in male and female patients were similar in the present study. Specifically, 123 patients were male, 122 were female, and 26 were of unknown sex. Patients seeking treatment are typically in the first half of their middle age. The mean age at the time of surgery for

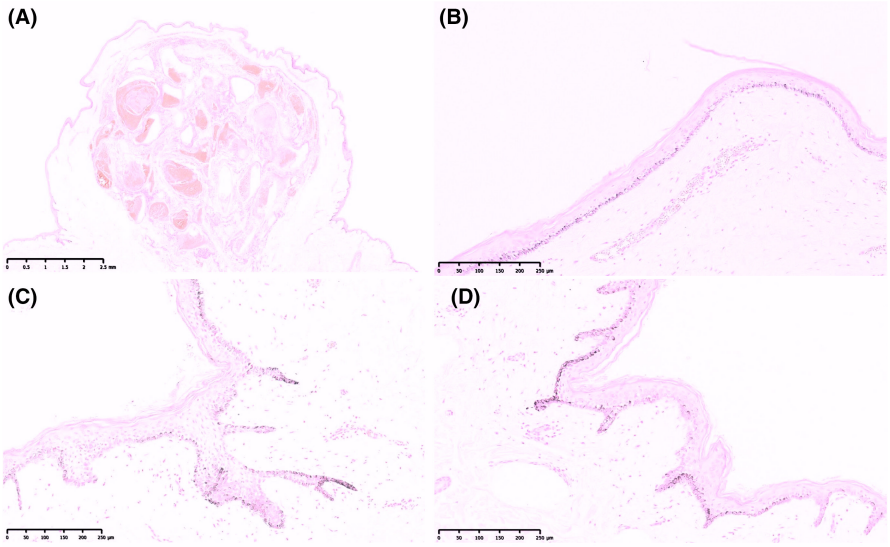

FIGURE 7 Masson–Fontana staining. Melanin granules are observable as black spots within the basal cell layer. (A: Masson–Fontana stain. Original magnification, ×10; scale bar, 2.5 mm). (B, C, D: Masson-Fontana stain. Original magnification, ×40; scale bar, 500 μm).

237 patients was 43.4 years (range: 6–82 years). In 226 of these cases, the sex was known; the mean age of the 114 male patients was 47.5 years (6–82 years), and that of the 112 female patients was 38.3 years (13–78 years). The nail bed and fingertips were the predominant sites in women, whereas the forearms, knees, arms, and legs were the predominant sites in men. In men, only 16 (14.3%) of 112 tumors were located on the fingers, whereas in women, 86 (74%) of the 116 tumors were on the fingers.

The pathogenesis of glomus tumors has not yet been established. Several factors have been observed in patients with glomus tumors that could potentially influence their pathogenesis. These include history of previous trauma, sex, location, age of onset, and familial occurrence. For example, subungual tumors are more prevalent in young women, while extradigital tumors are more common in older men. Multiple glomus tumors have been observed at birth or in early infancy and in an autosomal dominant inheritance pattern.[9] Glomus tumors are rare neoplasms of normal neuromyoarterial glomus bodies that typically present as blue to pink soft nodules with the classic triad of pain, pinpoint tenderness, and coldness. These tumors are often solitary and occur mainly in the subungual regions of the digits of the extremities, with extradigital locations being rare.[10] This clinicopathologic study involved 63 cases of glomus tumors of the soft tissues. The tumors manifest at different ages but are more common in early adulthood and most prevalent on the fingers (35 cases), frequently as subungual nodules (26 cases). Other sites of occurrence include the forearm (seven cases), knee (seven cases), and leg (six cases). Pain was reported by all except one patient. Histologically, glomus tumors are typically circumscribed and often delineated using well-defined fibrous capsules. Tumors with endothelium-lined vascular spaces surrounded by masses of epithelioid cells were categorized into three types: vascular (29 cases), myxoid (23 cases), and solid (11 cases). Electron microscopy revealed smooth muscle cells in four cases. The clinicopathological evidence presented supports the hypothesis that glomus tumors are tumor-like lesions of mesodermal disorders rather than a true neoplasm.[1]

Subungual glomus tumors may exhibit linear vascular structures on nail plate dermoscopy; however, investigators have identified four dermoscopic patterns listed in order of sensitivity from greatest to least: (1) a structureless purplish/red subungual spot with/without vessels; (2) a structureless purplish/red subungual spot and longitudinal erythronychia; (3) a structureless proximal purple/red subungual spot, longitudinal erythronychia, and a V-distal notch (this pattern found only in glomus tumors located on the nail matrix); and (4) a structureless subungual nail bed spot and distal onycholysis (most commonly associated with nail-bed tumors). Extradigital glomus tumors show a homogenous white structure (described as a structureless purple-white to reddish-white homogenous area) with peripheral telangiectasia (described as linear unfocused vessels).[9]

In the clinical differential diagnosis of an extradigital glomus tumor, a retrospective study of 56 cases noted hemangioma, neuroma, and neurofibroma as the most common misdiagnosis.[9,11] Extradigital glomus tumors exhibit peripheral telangiectasias (also described as linear unfocused vessels) and lack lacunae, distinguishing them from other vascular tumors.[9,12] On dermoscopy, most vascular lesions typically display well-demarcated, variably colored areas corresponding to the vascular proliferation of the lesions.[13] The patient's history should reveal recent trauma to the affected region, and attention should be taken to establish where and how the injuries

are treated. In cases without a history of trauma, consideration should shift toward genetic causes of neuromas and true neoplasms. Neuroma pain may manifest as burning, sharp, tingling, or numbness. Upon examination, a well-defined hard lump is typically seen, which is palpable and adherent to nearby structures. Under pressure, patients experience a sensation similar to an electric shock.[14] The diagnosis of neuroma relies primarily on history and examination. In cases of uncertainty, radiography can help rule out bone injury and malignancy. Ultrasound, computed tomography, and magnetic resonance imaging revealed well-defined soft tissue; however, these investigations are rarely necessary. No laboratory tests aid in diagnosis. After surgical excision, lesions are commonly sent for histopathology examination to rule out malignancy.[14] The dermoscopic features for diagnosing neurofibromas include a peripheral pigmented network, a peripheral halo of brown pigmentation, pink-red structureless areas, fingerprint-like structures, scar-like areas, fissures, and blood vessels.[15] Clinical differentiation was established between the condition in this case and the aforementioned three diseases.

In a 20-year retrospective study of extradigital glomus tumors, 9 of the initial 137 lesions originally classified as a glomus tumor were believed to have been misdiagnosed. The revised diagnoses for these lesions included hemangioma (six tumors), intradermal nevus (one tumor), myofibroma (one tumor), and myopericytoma (one tumor).[9,11] The case in this study did not show ulceration and lacunae, distinguishing it from other vascular tumors.[12] In intradermal nevi, nevus cells are relatively confined to the deeper layers of the dermis. They have a spindle-shaped, Schwann cell-like appearance with a markedly low melanin-producing capacity.[16] Myofibroma present a distinctive histological pattern, with an outer zone of spindle-shaped myofibroblasts arranged in fascicles and an inner zone of round cells with enlarged hyperchromatic nuclei surrounding thin-walled hemangiopericytoma-like blood vessels. Necrosis, calcification, and vascular extension may be present in the central area.[17] Myopericytoma is characterized by a well-circumscribed, nonencapsulated proliferation of spindle-shaped cells resembling myofibroblasts with oval nuclei and eosinophilic cytoplasm, arranged in perivascular concentric rings. Few mitoses are observed, and no necrosis has been reported.[18] Histopathological differentiation was established between the condition in this case and the aforementioned four diseases.

Excision is the definitive treatment for glomus tumors. Persistent or recurrent pain after glomus tumor excision may signify a residual neoplasm or a new tumor, occurring either in the postoperative period or later. If symptoms persist beyond 3 months postoperatively, consideration should be given to repeat imaging, repeat exploration, or both.[9]

In this study, (1) Noncontact dermoscopic findings were as follows: a purple color surrounded by a whitish area pattern corresponding to enlarged vessels surrounded by glomus cells.[9,10,12]; a homogenous demarcated whitish-yellow ring-like pattern with peripheral telangiectasias corresponding to Melanin granule within the basal cell layer of the epidermis, proliferative collagen fiber, and Mucin strong deposited in the papillary dermis at the tumor margins with linear unfocused vessels.[9,10,12,19] Dermoscopic findings of mucin deposits within the dermis were first reported in the literature in 2019 as a homogenous whitish pattern and sharply demarcated yellow border.[19] (2) Contact dermoscopic findings: Capsule-like pattern of thick white linear cords and patchy white structures covering the tumor corresponding to CD34-positive capsule and swollen collagen fibers. Description in 2016 Oliveira A of contact dermoscopy was a central purplish, structureless area that correlates to enlarged vessels within the neuromyoarterial glomus. The surrounding white homogeneous area corresponds to its fibrous capsule. Contact dermoscopy induced vessel collapse from pressure, allowing observation of the white area related to dermal collagen.[10]

Additionally, CD34 is known to be positive in endothelial cells and other vascular tumors such as deep angiomyxoma, epithelioid hemangioendothelioma, Kaposi's sarcoma, angiosarcoma, and hemangiopericytoma (solitary fibrous tumor); and a variety of nonvascular tumors, including dermatofibrosarcoma protuberans, epithelioid sarcoma, leiomyosarcoma, neurofibroma, and malignant peripheral nerve sheath tumors. It is important to note that CD34 is not a specific marker of endothelial cells.[20] In the case presented in this study, CD34 was negative for tumor cells, positive for endothelial cells within the vascular lumen, and positive for the pseudocapsule of the tumor (a dense fibrous pseudocapsule surrounding the solid sheet of tumor cells). There have been few studies involving immunostaining of the pseudocapsule of glomus tumors, and cases of CD34-negative glomus tumors with a CD34-positive pseudocapsule could not be retrieved from the literature.[21]

In conclusion, the dermoscopic presentation of extradigital glomus tumors has been documented in only seven previous case reports.[10,22–26] There is not a complete review of the literature on the dermoscopy of extradigital glomus tumors; in 2023, the paper by Cohen PR[9] was published. Although only one case is reported here, additional dermoscopic features of extradigital tumors have been presented.

AUTHOR CONTRIBUTIONS

Tomoaki Takada: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing – original draft; writing – review and editing.

ACKNOWLEDGMENTS

I am grateful to the patients for providing consent for the use of their samples in this study. We would also like to thank the Wiley Editing Service for English language editing.

FUNDING INFORMATION

This study received no external funding.

CONFLICT OF INTEREST STATEMENT

The author has no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

All the procedures adopted in this study adhered to the ethical standards of the World Medical Association Declaration of Helsinki. Ethical approval was not required for this study based on local and national guidelines.

CONSENT

Written informed consent was obtained from the patient for the publication of this case report and the accompanying images.

ORCID

Tomoaki Takada https://orcid.org/0000-0002-3537-5262

REFERENCES

1. Tsuneyoshi M, Enjoji M. Glomus tumor: a clinicopathologic and electron microscopic study. *Cancer*. 1982;50(8):1601-1607.
2. Lee Il J, Yoo YM, Lim H, Park MC. Glomus tumor of the back: a rare location. *J Craniofac Surg*. 2009;20(6):2153-2155. doi:10.1097/SCS.0b013e3181bec705
3. Lee DW, Yang JH, Chang S, et al. Clinical and pathological characteristics of extradigital and digital glomus tumors: a retrospective comparative study. *J Eur Acad Dermatol Venereol*. 2011;25(12):1392-1397. doi:10.1111/j.1468-3083.2011.03979.x
4. Wood W. On painful subcutaneous tubercle. *Edinb Med Surg J*. 1812;8(31):283-291.
5. Le MP. glomus neuromyoarterial des regions tactiles et ses tumeurs. *Lyon Chir*. 1924;21:257-280.
6. Mason ML, Weil A. Tumor of a subcutaneous glomus. *Surg Gynecol Obstet*. 1934;58:807-816.
7. Horton C, Maguire C, Georgiade N, Pickrell K. Glomus tumors; an analysis of twenty-five cases. *AMA Arch Surg*. 1955;71(5):712-716. doi:10.1001/archsurg.1955.01270170070012
8. Beaton LE, Davis L. Glomus tumor – reports of three cases; analysis of 271 recorded cases. *Q Bull Northwest Univ Med Sch*. 1941;15(4):245-254.
9. Cohen PR. Glomus extradigital tumor: a case report of an extradigital glomus tumor on the wrist and comprehensive review of glomus tumors. *Cureus*. 2023;15(5):e38737. doi:10.7759/cureus.38737
10. Oliveira A. Dermoscopy in the diagnosis of extradigital glomus tumors. *Int J Dermatol*. 2016;55(9):e506-e508. doi:10.1111/ijd.13289
11. Schiefer TK, Parker WL, Anakwenze OA, Amadio PC, Inwards CY, Spinner RJ. Extradigital glomus tumors: a 20-year experience. *Mayo Clin Proc*. 2006;81(10):1337-1344. doi:10.4065/81.10.1337
12. Álvarez-Salafranca M, Bañuls J, Thomas L, et al. Dermoscopy of glomus tumor: a cross-sectional study of 86 cases. *J Eur Acad Dermatol Venereol*. 2022;36(11):2016-2024. doi:10.1111/jdv.18432
13. Piccolo V, Russo T, Moscarella E, Brancaccio G, Alfano R, Argenziano G. Dermatoscopy of vascular lesions. *Dermatol Clin*. 2018;36(4):389-395. doi:10.1016/j.det.2018.05.006
14. Zabaglo M, Dreyer MA. Neuroma. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing. 2023. https://www.ncbi.nlm.nih.gov/books/NBK549838/.
15. Duman N, Elmas M. Dermoscopy of cutaneous neurofibromas associated with neurofibromatosis type 1. *J Am Acad Dermatol*. 2015;73(3):529-531. doi:10.1016/j.jaad.2015.05.021
16. Kroumpouzos G, Cohen LM. Intradermal melanocytic nevus with prominent Schwannian differentiation. *Am J Dermatopathol*. 2002;24(1):39-42. doi:10.1097/00000372-200202000-00008
17. Shahzad F, Chappell AG, Purnell CA, Aldulescu M, Chamlin S. Infantile myofibroma presenting as a large ulcerative nodule in a newborn. *Case Rep Pediatr*. 2019;2019:3476508. doi:10.1155/2019/3476508
18. Ruiz-Arriaga LF, Teran ALR, Ortiz-Hidalgo C, et al. Myopericytoma in an unusual location. *Dermatol Online J*. 2018;24(4):13030/qt5z02t0dk. doi:10.5070/D3244039361
19. Biondo G, Sola S, Pastorino C, Massone C. Clinical, dermoscopic, and histologic aspects of two cases of cutaneous focal mucinosis. *An Bras Dermatol*. 2019;94(3):334-336. doi:10.1590/abd1806-4841.20198381
20. Hatori M, Aiba S, Kato M, Kamiya N, Kokubun S. Expression of CD34 in glomus tumors. *Tohoku J Exp Med*. 1997;182(3):241-247. doi:10.1620/tjem.182.241
21. Skelton HG, Smith KJ. Infiltrative glomus tumor arising from a benign glomus tumor: a distinctive immunohistochemical pattern in the infiltrative component. *Am J Dermatopathol*. 1999;21(6):562-566. doi:10.1097/00000372-199912000-00011
22. Ishitsuka Y, Ohara K, Otsuka F. Solitary glomus tumor on the nostril of a child. Unusual clinical presentation. *Acta Derm Venereol*. 2010;90(4):415-416. doi:10.2340/00015555-0898
23. Takamichi I, Yoshida Y, Masutaka F, Yamamoto O. Solitary nodule on the nose: a quiz. *Acta Derm Venereol*. 2013;93(3):379-380. doi:10.2340/00015555-1480
24. Idoudi S, Arousse A, Boussofara L. Glomus tumor of the buttock. *Dermatol Pract Concept*. 2019;9(4):318-319. doi:10.5826/dpc.0904a19

25. Lahouel M, Lahouel I, Soua Y, et al. Clinical and Dermoscopic features of an extradigital glomus tumor of the Back. *Dermatol Pract Concept*. 2020;10(4):e2020077. doi:10.5826/dpc.1004a77
26. Garcia LC, Fernandes ENS, Sobreira NP, Bittencount FV. Extradigital glomus tumor: dermoscopic description and histopathological correlation. *An Bras Dermatol*. 2021;96(6):765-767. doi:10.1016/j.abd.2020.11.008

How to cite this article: Takada T. Relationship between dermoscopic and histopathological findings of extradigital glomus tumors. *Clin Case Rep*. 2024;12:e8907. doi:10.1002/ccr3.8907