

Palmar Venous Malformation: A Case Report of a Rare Occurrence and a Treatment Algorithm

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Summary: Palmar venous malformations are not well described in the surgical literature and are a therapeutic challenge due to the intricate anatomy of the hand. We present the case of a 19-year-old right-handed female patient from Mexico who was referred to us with a right palmar lesion present since birth, previously diagnosed as a venous malformation. The patient reported that she had undergone sclerotherapy 10 years before in addition to a prior aborted attempt at excision. Venous palmar malformations are rare occurrences. Although an individualized approach is important, the development of an algorithm may assist in the standardization of the treatment of this pathology to preserve the hand's functional status. (*Plast Reconstr Surg Glob Open* 2022;10:e4270; doi: [10.1097/GOX.0000000000004270](https://doi.org/10.1097/GOX.0000000000004270); Published online 14 April 2022.)

According to the International Society for the Study of Vascular Anomalies classification system, vascular anomalies are categorized into vascular tumors and vascular malformations.¹ A detailed description of the vascular anomalies of the hand and upper extremity is presented in Table 1. Tumors are a result of proliferating endothelium resulting in rapid cellular division. These include hemangiomas, kaposiform hemangioendotheliomas, and pyogenic granulomas. Hemangiomas are further subdivided by their presence at birth (congenital) versus not (infantile). Congenital hemangiomas are finally divided into two categories depending on their involution (rapidly involuted versus noninvolved congenital hemangiomas, Table 1). Vascular malformations are caused by errors in morphogenesis that may affect any segment of the vascular tree.^{2,3} Malformations are divided into venous, arteriovenous, lymphatic, and capillary malformations (Table 1).⁴

Vascular malformations may affect arteries, veins, capillaries, or lymphatics singly or in combination. Vascular malformations are broadly categorized into high flow and

low flow malformations. Low flow lesions are typically soft and compressible; they are divided into capillary, venous, lymphatic, and combined malformations. High flow lesions are typically arterial-venous malformations.⁵

Venous malformations are the most common form of vascular malformation, and affect approximately 1% of the population.⁶⁻⁸ They are present at birth and enlarge as the child grows. Evidence suggests that due to hormonal influences, venous malformations accelerate their growth during puberty and pregnancy as well.⁹ Venous malformations of the hand are a rare entity and there is not enough guidance regarding the treatment of these lesions.¹⁰ Under the pathology microscope, venous malformations are characterized by masses of veins and venules of different dimensions lined by a single layer of endothelial cells.

CASE DESCRIPTION

We present the case of a 19-year-old right-handed female patient from Mexico who was referred to us with a right palmar lesion previously diagnosed as a venous malformation that has been present since birth. The patient reported that she had undergone sclerotherapy 10 years before in addition to a prior attempt at excision. She reported that the surgery was aborted, and the lesion did not respond to sclerotherapy and retained its size.

On presentation the patient had a soft right palmar lesion, mildly tender, located between the third and fourth metacarpals with indistinct borders and an overlying scar from previous surgery. The patient was complaining of pain overlying the palmar lesion that radiated to her elbow

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Table 1. Classification of Vascular Anomalies of the Hand and Upper Extremity

Tumors	Pyogenic granuloma	Congenital	Rapidly involuting congenital hemangioma Non involuting congenital hemangioma
	Hemangioma		
Malformations	Infantile		
	Kaposiform hemangioendothelioma		
	Arteriovenous		
	Capillary		
	Venous		
	Lymphatic		

in the ulnar nerve distribution. She had a normal range of motion of all her digits and her sensation was intact. Before her clinic appointment, she had an MR angiography performed that demonstrated a 6.1 cm × 3.0 cm × 2.1 cm right palmar venous malformation, located between the third and fourth metacarpals, with no bone involvement (Fig. 1).

Following a discussion with the vascular surgery service, it was decided that repeat sclerotherapy would be futile, and surgical excision was offered to the patient. We proceeded with surgical excision. The dissection was carried out under tourniquet without exsanguination. Only hand elevation was performed to allow for easier identification of the venous malformation. Loupe magnification was utilized. During excision, the malformation was found to measure 4.5 cm × 1.5 cm. It was found to run the length of the palm of the right hand to the superficial palmar arch and distal to the base of the third and fourth digits. The lesion was closely adherent to the ulnar digital artery and nerve of the third digit. All critical structures were identified and preserved, including the superficial palmar arch. The malformation was then excised with sharp dissecting scissors (Figs. 2, 3).

The pathology report was consistent with a venous malformation. On her first postoperative visit, the patient reported loss of sensation over ulnar aspect of middle finger and some weakness with flexion. She was encouraged to continue hand exercises. On subsequent clinic visits, the patient's sensation continued to improve. Furthermore, the patient had an excellent range of motion and had no recurrence at 12 months follow-up. The patient was then discharged from the clinic.

DISCUSSION

We opted for surgical excision in this case based on the site and extent of the venous malformation and the patient's history. In the literature, management of venous malformation may be based on a single technique or require a multimodal approach. In fact, early attempts at surgical cure of venous malformations were disheartening. In 1976, Szilagyi et al noted: "With few exceptions, their cure by surgical means is impossible."¹¹ Surgical removal of VM as a first approach is seldom indicated. Other treatment options include cryotherapy, irradiation, and sclerotherapy.¹² Conservative measures (such as aspirin,



Fig. 1. MRI of the right hand, utilizing angiographic protocol.

elevation, and compressive dressing) are reasonable first steps for asymptomatic venous malformations.

Sclerotherapy has provided good results for many patients with venous malformations.¹³ Sclerosants are administered by direct puncture under fluoroscopic guidance into the venous malformation cavities; here, they directly damage the endothelium. Although curative in some cases, in other cases, they are used as a preparatory aid before surgical eradication of the venous malformation. Sclerotherapy before surgery can also be used to decrease blood loss.¹⁴ Commonly applied for malformations in other areas of the body, preoperative sclerotherapy may similarly decrease the risk of intraoperative and postoperative bleeding, as well as injury to surrounding structures.¹⁵

Surgical resection plays a good adjunctive role when sclerotherapy is impossible due to the anatomic site, when it is impossible due to the extent of the lesion, when it fails, or when complete excision of the lesion is possible with low morbidity. Steiner et al reported a low overall complication rate of 9.7%, including a major complication rate of 3.4%, and high patient satisfaction with surgical treatment of selected patients with venous malformations.¹⁶ The proposed algorithm of our institution is presented in Supplemental Digital Content 1. (See figure, Supplemental Digital Content 1, which shows the proposed protocol for the management of venous malformations of the hand. <http://links.lww.com/PRSGO/B997>.)



Fig. 2. Picture of the specimen after excision.



Fig. 3. Illustration depicting the anatomic relationship of the venous malformation and surrounding structures. Notice the close relationship with the digital nerves that need to be identified and protected before excision of the malformation (illustration provided by Ian Wood, MD).

Our patient had failed initial sclerotherapy to address her palmar venous malformation as a child. The lesion grew as the patient underwent puberty and become more symptomatic with time. At the age of 19, she underwent surgical resection with preservation of the superficial palmar arch along with sensory and motor nerves to the digits. With appropriate hand exercises, the patient was able to return to her baseline performance and sensation.

Venous malformations of the palmar surface of the hand are not well described in the literature. Due to their precarious location surrounded by vital structures for function of the hand, this case provided a unique challenge to the surgical team.

It needs to be noted that treatment of venous malformations in the hand poses unique challenges: the terminal circulation of the hand is prone to hand ischemia when some of the mentioned therapies are used; in addition, the close relationship of important structures (nerves and tendons) may cause postoperative complications that are unique to the area (neuropathies, tendon ruptures, etc.).¹⁷ Andelman et al reported acute hand ischemia in cases of sclerotherapy to treat venous malformations of the hand.¹⁸

A meta-analysis by Schmidt et al, however, concluded that sclerotherapy is both safe and effective in the treatment of these lesions, even when previous attempts have been made.¹⁹ Guevara et al reported their overall complication rate following sclerotherapy of venous malformations of the hand and distal forearm in 17 patients who underwent a total of 40 procedures. They only noted two skin complications that had a complete resolution. They noted no nerve damage, either motor or sensory.²⁰ The literature is scant with regard to complications following surgical resection; however, Manoli et al reported no serious complications in a cohort of 21 patients undergoing surgical resection of venous malformations of the hand.²¹

CONCLUSIONS

Palmar venous malformations are not well described in the surgical literature. Our experience with this patient provided us an opportunity to refine our treatment algorithm for patients with this disease.

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REFERENCES

1. Marler JJ, Mulliken JB. Current management of hemangiomas and vascular malformations. *Clin Plast Surg*. 2005;32:99–116, ix.
2. Tille JC, Pepper MS. Hereditary vascular anomalies: new insights into their pathogenesis. *Arterioscler Thromb Vasc Biol*. 2004;24:1578–1590.
3. Fleming AN, Smith PJ. Vascular cell tumors of the hand in children. *Hand Clin*. 2000;16:609–624.
4. Upton J, Mulliken JB, Murray JE. Classification and rationale for management of vascular anomalies in the upper extremity. *J Hand Surg Am*. 1985;10(6 Pt 2):970–975.
5. Jacobs BJ, Anzarut A, Guerra S, et al. Vascular anomalies of the upper extremity. *J Hand Surg Am*. 2010;35:1703–1709; quiz 1709.
6. Mulliken JB, Burrows PE, Fishman SJ. *Mulliken and Young's Vascular Anomalies: Hemangiomas and Malformations*. New York: Oxford University Press; 2013.
7. Ali B, Panossian A, Taghinia A, et al. Diffuse venous malformations of the upper extremity (Bockenheimer disease): diagnosis and management. *Plast Reconstr Surg*. 2020;146:1317–1324.
8. Behraves S, Yakes W, Gupta N, et al. Venous malformations: clinical diagnosis and treatment. *Cardiovasc Diagn Ther*. 2016;6:557–569.
9. Burrows PE, Mulliken JB, Fellows KE, et al. Childhood hemangiomas and vascular malformations: angiographic differentiation. *AJR Am J Roentgenol*. 1983;141:483–488.
10. Beijnen UEA, Saldanha F, Ganske I, et al. Verrucous venous malformations of the hand. *J Hand Surg Eur Vol*. 2019;44:850–855.
11. Szilagyi DE, Smith RF, Elliott JP, et al. Congenital arteriovenous anomalies of the limbs. *Arch Surg*. 1976;111:423–429.

12. Colletti G, Valassina D, Bertossi D, et al. Contemporary management of vascular malformations. *J Oral Maxillofac Surg*. 2014;72:510–528.
13. Dompmartin A, Vikkula M, Boon LM. Venous malformation: update on aetiopathogenesis, diagnosis and management. *Phlebology*. 2010;25:224–235.
14. Berenguer B, Burrows PE, Zurakowski D, et al. Sclerotherapy of craniofacial venous malformations: complications and results. *Plast Reconstr Surg*. 1999;104:1–11; discussion 12.
15. Holly BP, Patel YA, Park J, et al. Preoperative epoxy embolization facilitates the safe and effective resection of venous malformations in the hand and forearm. *Hand (N Y)*. 2017;12:335–341.
16. Steiner F, FitzJohn T, Tan ST. Surgical treatment for venous malformation. *J Plast Reconstr Aesthet Surg*. 2013;66:1741–1749.
17. Fujiki M, Kurita M, Ozaki M, et al. Detrimental influences of intraluminally-administered sclerotic agents on surrounding tissues and peripheral nerves: an experimental study. *J Plast Surg Hand Surg*. 2012;46:145–151.
18. Andelman SM, Walsh AL, Rubin TA, et al. Acute hand ischemia following elective venous sclerotherapy for dorsal hand varicose veins. *J Hand Surg Am*. 2017;42:666.e1–666.e5.
19. Schmidt VF, Masthoff M, Goldann C, et al. Percutaneous sclerotherapy of venous malformations of the hand: a multicenter analysis. *Cardiovasc Intervent Radiol*. 2021;44:1543–1550.
20. Guevara CJ, Gonzalez-Araiza G, Kim SK, et al. Sclerotherapy of diffuse and infiltrative venous malformations of the hand and distal forearm. *Cardiovasc Intervent Radiol*. 2016;39:705–710.
21. Manoli T, Micheel M, Ernemann U, et al. Treatment algorithm and clinical outcome of venous malformations of the limbs. *Dermatol Surg*. 2015;41:1164–1170.