Venous Malformation of the Palm in a Collegiate Crew Athlete

Jonathan A. Drezner, MD, and John W. O'Kane, MD

Vascular anomalies represent the fourth most common tumor of the hand[1,2] but are not well documented in the primary care literature. This case report describes a collegiate crew athlete who complained of a painful venous malformation of the palm. A review of the classification, diagnosis, and management of cutaneous vascular lesions is included.

Case Report

An 18-year-old female collegiate rower came to the training room complaining of a painful bluish mass on her right palm. She had recently completed a 1-hour rowing workout followed by a 1-hour weight-lifting session. The mass developed toward the end of her weight-lifting workout. She denied any direct trauma or blow to her hand, and there was nothing unusual about her training sessions. She had never experienced similar symptoms in the past. Her medical history was unremarkable. She was on no medications and denied any tobacco or alcohol use.

On physical examination a subcutaneous mass with blue coloration was located on the palmar surface of the right hand. The mass measured 10.0 × 0.8 mm and was in line with a superficial vein that ran along the base of the thenar eminence. It was very tender to touch, mobile, and did not blanch under pressure. Radial pulse was normal, and an Allen test showed an intact arterial arch. Findings of a neurologic examination were normal.

Magnetic resonance imaging (MRI) showed a discrete mass without deep tissue extension (Figure 1). Doppler ultrasonography showed no blood flow through the lesion.

The patient underwent a 1-week trial of rest, ice, compression, and anti-inflammatory medication without improvement. She was referred to a hand surgeon, who performed an open excision of the mass while the patient was under general anesthesia. The excised mass measured 1.0 cm in its greatest dimension. Histologic analysis (Figure 2) showed benign blood vessels with abnormal morphologic features consistent with a venous malformation. Intralesional thrombosis was also found. There was no endothelial hyperplasia or arterial component.

The patient had an uncomplicated postoperative course and returned to rowing within 2 months of her surgery. The final diagnosis was a venous malformation with evidence of intralesional thrombosis.

Discussion

To our knowledge, this case report is the first of a venous malformation in a collegiate crew athlete. Although vascular lesions represent the fourth most common tumor of the hand, they have not been previously described in the family practice literature. Vascular anomalies account for 5% to 8% of all hand tumors, with only ganglions, mucous cysts, and giant cell tumors of the tendon sheath occurring more frequently.[1,2]

A variety of descriptive and histologic terms has evolved in an attempt to classify cutaneous vascular lesions. The lack of consistent definitions has impeded attempts to characterize their exact incidence and clinical course. Historically, *hemangioma* has been used as a generic word for any vascular anomaly.[3] In 1982 Mulliken and Glowacki[4] proposed a simplified biologic classification of vascular lesions based on cellular features and correlated with physical examination and growth characteristics.

Submitted 11 January 2001.
From the Department of Family Practice and Community Medicine (JAD), University of Pennsylvania, Philadelphia, and the Department of Orthopedics (JWO), University of Washington School of Medicine, Seattle. Address reprint requests to Jonathan A. Drezner, MD, Department of Family Practice and Community Medicine, University of Pennsylvania, 51 N. 39th St, 6 Mutch Building, Philadelphia, PA 19104.

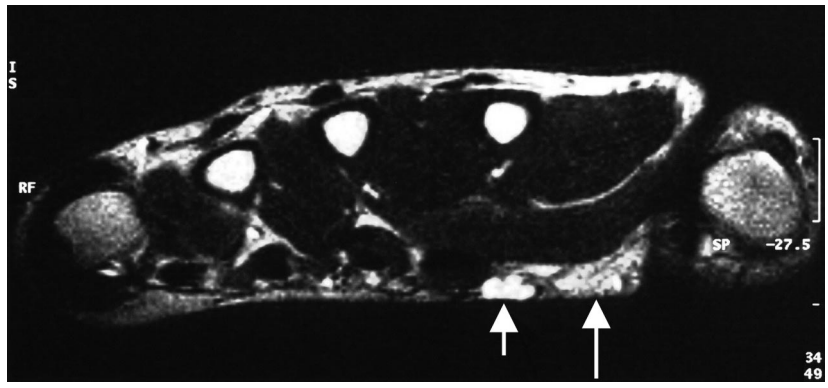

Figure 1. T2-weighted coronal magnetic resonance image of the right hand showing a superficial palmar mass (short arrow) adjacent to the thenar fat pad (long arrow).

The study by Mulliken and Glowacki[4] in infants and children defined two major types of vascular lesions: (1) hemangiomas and (2) malformations.

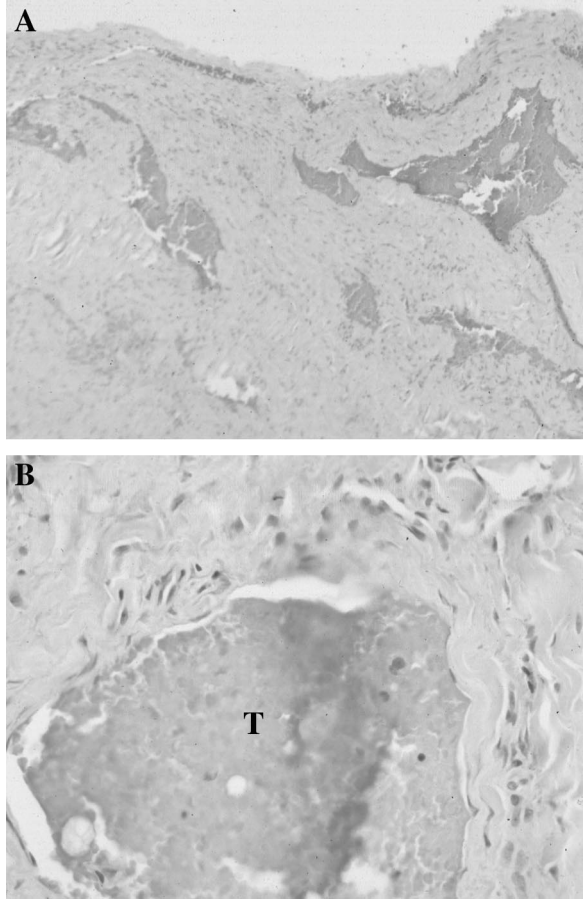

Figure 2. Low (A) and high (B) power light microscopy of the venous malformation under hematoxylin and eosin stain. Note the intraluminal thrombosis (T) in panel B.

Hemangiomas are the most common cutaneous tumor of infancy and are characterized by rapid growth and proliferation. Hemangiomas undergo a slow and spontaneous involution with subsequent regression within 5 to 7 years. Histologically, hemangiomas are characterized by endothelial hypercellularity and increased mitotic activity during the proliferation phase and by fibrosis and fat deposition during the involution phase.[4]

Unlike hemangiomas, malformations have a normal rate of endothelial cell turnover, enlarge proportionately with the growth of the child, and do not undergo spontaneous involution.[4] Malformations are further subdivided based on their cellular composition into either slow-flow (capillary, venous, lymphatic, or mixed) or fast-flow (arteriole, arteriovenous fistulae, or shunt) subtypes.[3] The term *cavernous* is used to describe large-channel venous or lymphatic malformations consisting of dilated, thin-walled, endothelial-lined sinuses engorged with red blood cells.[4] Cavernous lesions are the most common vascular tumor of the hand and account for approximately 23% to 46% of cases.[2,3,5]

Throbbing pain and progressive enlargement of a bluish mass are the most common presenting symptoms.[2] In the hand, the palm is the most common location of vascular anomalies because of its rich vascular network. Patients might complain of recurrent pain during exercise secondary to vasodilatation and distention of the lesion.[3] Acute symptoms can also be secondary to thrombosis.

Physical examination shows a poorly defined bluish or reddish mass. Tenderness on examination likely represents spontaneous thrombosis within the tumor. Venous malformations are easily com-

pressible and can blanch under pressure. Capillary malformations might not be as compressible because of their small-caliber vessels and narrow lumens.[6] Slow-flow lesions enlarge when venous return is obstructed and decrease in size with extremity elevation.[2,3] Fast-flow malformations might not resolve with extremity elevation and might have a palpable thrill or bruit.[3]

Imaging studies should be used to determine flow characteristics and outline the extent of the lesion. Ultrasonography using color Doppler flow analysis can confirm fast-flow anomalies.[7] MRI, with or without intravenous gadolinium, can be used to define the lesion in relation to surrounding tissues.[3] Recently, magnetic resonance angiography (MRA) has been combined with MRI to provide detailed information regarding flow characteristics and the extent of local tissue involvement.[8] Invasive angiography is rarely used for diagnosis but can be useful before extensive surgery or for embolization.[3] Plain radiographs are of little value but can show calcified phleboliths or cortical erosion of bone in approximately 6% of cases.[2]

Palmieri[2] previously suggested that tenderness on examination could represent spontaneous thrombosis within the tumor. In this case report, histologic study confirmed the presence of intralesional thrombosis (Figure 2). We believe her initial condition marked by pain and tenderness was due to the development of an acute intralesional thrombosis. In the presence of intralesional thrombosis, malformations are unlikely to change in size with compression or extremity position, and imaging studies are unlikely to show active blood flow.

Enlargement of an existing or previously unrecognized malformation can be caused by mechanical or hormonal factors. Malan and Puglionisi[9] proposed that pressure or flow characteristics could reactivate dormant angiopoietic cells and stimulate endothelial cell growth. In our athlete, it is possible that chronic repetitive mechanical stress to the palms during rowing and training sessions stimulated vascular growth and caused an otherwise unrecognized vascular malformation to enlarge. Additionally, repetitive mechanical irritation likely played a role in the development of intralesional thrombosis.

Hormonal factors are also implicated in the enlargement of vascular malformations. Using current definitions, vascular malformations occur more commonly in female patients with a female-male ratio of 1.5:1.[3] Older studies not distinguishing malformations from hemangiomas also found a higher incidence of vascular anomalies in female patients of approximately 2:1.[2,5,6] The higher incidence of vascular anomalies in female patients and their rapid growth noted at the onset of puberty and during pregnancy suggest that malformations are modulated in some fashion by female sex hormones.[6]

Management of vascular lesions is guided by location, flow characteristics, symptoms, functional disability, and cosmetic deformity.[10] Vascular anomalies should be classified first as either a hemangioma or a malformation. Hemangiomas are characterized by their rapid growth and spontaneous involution and usually resolve before adulthood. Thus, most symptomatic vascular lesions in adults will represent malformations. Malformations should further be subdivided into slow-flow (capillary, venous, lymphatic, and mixed) or fast-flow (arteriole, arteriovenous fistulae, and shunt) based on imaging studies.

Management of symptomatic vascular malformations consists primarily of surgical excision. Conservative treatment with rest, compression, and analgesics can be attempted but is unlikely to result in complete resolution. Indications for surgical excision include pain, functional impairment, progressive growth, compressive neuropathy, or problems caused by mass effect.[3] The risk of recurrence after surgical excision increases with the presence of arteriovenous shunts, local tissue infiltration, and lesions greater than 2 cm.[5] Selective arteriole embolization might be helpful in fast-flow anomalies before surgical resection.[3]

Treatment of childhood hemangiomas consists mainly of observation until involution occurs. Nonsurgical treatments, such as injection of sclerosing agents, radiation, or cryotherapy, have showed poor results for subcutaneous hemangiomas.[11] Cryotherapy and argon laser therapy may be considered when the lesion is intradermal but can result in a broad fibrous white scar.[2]

Conclusions

Cutaneous vascular lesions are the fourth most common tumor of the hand and should be classified as either a hemangioma or a malformation. Throbbing pain and progressive enlargement of a bluish mass are the most common symptoms. Tenderness

on examination represents spontaneous thrombosis within the lesion. Repetitive mechanical irritation, hormonal factors, or acute intralesional thrombosis can influence sudden growth of a lesion. MRI should be used to define the extent of the lesion, and Doppler ultrasonography or MRA used to determine flow characteristics. Conservative management is rarely successful for symptomatic lesions, and surgical excision is usually required.

References

1. Bogumill GP, Sullivan DJ, Baker GI. Tumors of the hand. Clin Orthop 1975;108:214–22.
2. Palmieri TJ. Subcutaneous hemangiomas of the hand. J Hand Surg 1983;8:201–4.
3. Upton J, Coombs CJ, Mulliken JB, Burrows PE, Pap S. Vascular malformations of the upper limb: a review of 270 patients. J Hand Surg 1999;24A:1019–35.
4. Mulliken JB, Glowacki J. Hemangiomas and vascular malformations in infants and children: a classification based on endothelial characteristics. Plast Reconstr Surg 1982;69:412–22.
5. Niechajev IA, Karlsson S. Vascular tumors of the hand. Scand J Plast Reconstr Surg 1982;16:67–75.
6. Watson WL, McCarthy WD. Blood and lymph vessel tumors. Surg Gynecol Obstet 1940;71:569–88.
7. Hutchinson DT. Color duplex imaging. Applications to upper-extremity and microvascular surgery. Hand Clin 1993;9:47–57.
8. Disa JJ, Chung KC, Gellad FE, Bickel KD, Wilgis EF. Efficacy of magnetic resonance angiography in the evaluation of vascular malformations of the hand. Plast Reconstr Surg 1999;99:136–44.
9. Malan E, Puglionisi A. Congenital angiodysplasias of the extremities: I: generalities and classification; venous dysplasias. J Cardiovasc Surg 1964;239:87–130.
10. McClinton MA. Tumors and aneurysms of the upper extremity. Hand Clin 1993;9:151–69.
11. Glanz S. The surgical treatment of cavernous heamangiomas of the hand. Br J Plast Surg 1969;22:293–301.