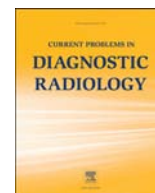




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Developing a Multidisciplinary Vascular Anomalies Clinic and Reviewing the Radiologist's Clinic Role

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Cutaneous vascular anomalies can be challenging to diagnose and treat given their rare presentation and that they do not always fall under the purview of a specific medical specialty. Patients with cutaneous vascular anomalies are best managed in vascular anomalies clinics, but to our knowledge, no reported publications exist on how to develop such a clinic. In this article, we describe the specific steps our institution took to create a vascular anomalies clinic and discuss how it benefitted our patients and referring providers. We also highlight the roles of the diagnostic and interventional radiologist within a vascular anomalies clinic.

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Description of the Problem

Cutaneous vascular anomalies represent a group of disorders that afflict children and adults, with the potential to cause minor deformity to major disfigurement, pain and limitations in physical mobility, somatic growth and structural abnormalities, functional or life threatening issues, and rarely, death. Although there is much published on vascular anomalies, diagnosis and treatment can be challenging.¹ Vascular anomalies are rare, which can render them difficult to correctly diagnose on physical and imaging examinations.² Patients with vascular anomalies may not always have a primary provider and are strained to visit several types of physicians, each of them having a variety of treatment options or none.² Lastly, the nomenclature has arguably been one of the largest roadblocks in adequate understanding of vascular anomalies and their corresponding therapeutic options.^{1,3,4}

Like many other institutions, our tertiary-level hospital did not have a multidisciplinary vascular anomalies clinic. Owing to disease unfamiliarity, some patients were misdiagnosed, and at times, extraneous tests or invasive treatments, including radical surgeries, were performed. We realized that these practices were unsustainable for our patients and hospital, and an intervention was necessary.

Institutional Approach Employed to Address the Problem

To overcome the aforementioned challenges, we created our own cutaneous vascular anomalies clinic. Several steps were

performed in the initial creation of the clinic and for its ongoing functioning.

Develop a Multidisciplinary Team

The vascular anomaly clinic members represent the clinic's core; therefore, a thorough search of providers was performed, assessing both expertise and interest. We recruited physicians and practitioners trained in pediatric dermatology, diagnostic radiology, interventional radiology, hematology-oncology, pediatric surgery, pediatric otolaryngology, pediatric neurology, procedural or laser dermatology, and physical therapy. Nearly all members had prior experience working in a vascular anomalies clinic.

Design the Clinic Format

Our vascular anomalies clinic currently meets for one half-day every 2 months and is subdivided to address 2 groups of patients: in absentia and in person. For the in absentia patients, we review the clinical and radiologic images digitally while the patient is not physically present. Common indications for in absentia referrals include: determining if the patient has a vascular anomaly, recommending diagnostic imaging studies as needed, reviewing follow-up laboratory or imaging results of previously seen patients, treatment planning in uncomplicated patients, and triaging which patients would best be seen in person at a subsequent clinic.

For our in person patients, we similarly review their records, and then all clinic members will see the patient together in one setting. A group-based clinical history and physical examination are performed, followed by a review of imaging with the patient and family, discussion of possible treatment options and further follow-up. Afterwards, all clinic provider members specifically

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involved with each patient will document their recommendations in the electronic medical record. This summary is sent to the patient's primary care provider or the referring provider.

Establish Clinic Roles, Including the Radiologist and Interventional Radiologist

We appointed a pediatric dermatologist as our clinic leader to orchestrate the clinical discussion and logistics of the clinic. During each clinic, each of the other vascular anomaly clinic members provides clinical expertise under the purview of their specialty.

Since imaging plays a central role in the diagnosis of vascular anomalies, a diagnostic radiologist is part of the vascular anomaly clinic team. In our clinic, the radiologist reviews all available imaging examinations for each clinic patient and succinctly presents the pertinent imaging findings and diagnosis to the group. During the in person patient encounter, the radiologist routinely shows and explains the imaging examinations to the patient and patient's family. At the end of the clinic, the radiologist documents the imaging findings in the electronic medical record.

The interventional radiologist is another important member to the clinic team, and one of his or her main roles is to direct potential treatment. Certain vascular malformations, such as venous or lymphatic malformations are amenable to percutaneous sclerotherapy, whereas other lesions such as arteriovenous malformations may be treated with catheter embolization. In conjunction with the clinic members, the interventional radiologist discusses which patient is best suited for the aforementioned treatments, while weighing possible medical and surgical treatments and nonintervention.

Individually Protocol Imaging Studies

At our institution, radiologic examinations are either self-booked by the referring providers with routine imaging protocols or are individually protocolled by a radiologist, depending on the provider preference, modality type, or clinical indication. Like other institutions, we believe that customized examination protocoling can add value by ensuring the right imaging protocol is performed for the right patient.⁵ We applied this concept to magnetic resonance imaging of vascular anomalies, as individually tailored protocols can accommodate anomalies that require imaging of more than 1 body part, vascular imaging, and even advanced techniques.^{6,7} Many MRI examinations are performed with sedation in children, therefore, it is paramount the examination is imaged correctly to avoid additional sessions of sedation. We have found that individually protocoling vascular anomaly studies has facilitated more accurate diagnoses for our vascular anomaly clinic.

Coordinate Biopsy

Our vascular anomalies clinic members collaborate outside the clinic to perform biopsies. We do not usually biopsy the majority of vascular anomalies; however, certain lesions, such as vascular tumors like kaposiform hemangioendothelioma, may be biopsied to confirm the clinical and imaging diagnosis. Biopsy in children can be challenging without the use of sedation, but if sedation is being performed for the MRI examination, biopsy can take place immediately afterwards while the patient is still sedated. At our institution, this is done in the MRI patient holding area, with the dermatologist performing the biopsy and the anesthesiologist monitoring sedation. The radiologist is also present to help direct the appropriate biopsy site based on the recent MRI examination.

Spread the Word

To raise awareness of our newly established clinic, we reached out to our referring providers and patients in a variety of settings. We spoke to many physicians in our hospital that have previously seen patients with vascular anomalies. If a vascular anomaly was identified on imaging, either unsuspectingly or during follow-up, the radiologist would send a message to the referring provider via the electronic medical record portal to provide information about the clinic, should he or she and the patient desire the clinic expertise. A grand rounds presentation was also performed in our hospital to educate referring providers on vascular anomalies and to provide referral information about our clinic. Lastly, vascular clinic providers that were previously seeing patients with vascular anomalies in their specialty clinics would ask patients if they wished to be referred to the multidisciplinary clinic.

Analysis

To test the qualitative benefits of our new vascular anomalies clinic, we anonymously surveyed referring providers and their respective patients (or patient guardians) that attended our vascular anomalies clinic (Tables 1 and 2). Our institutional review board approved this study.

Outcomes and Discussion

It has been more than 1 year since the introduction of our vascular anomalies clinic, and the change has revolutionized our clinical practice. Patients are correctly diagnosed in a timely fashion, appropriate treatments are administered, and it has enhanced both the quality of care and the service provided to patients.

Before the foundation of our clinic, it was not uncommon for patients to see multiple physicians and receive several imaging

TABLE 1
Referring provider survey on the vascular anomalies clinic (n = 21)

Question	Percentage responding				
	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
Since the creation of the vascular anomalies clinic, are you satisfied with the clinic's care of your patient?	43	38	14	5	0
Do you think patients with complex vascular anomalies are best managed in a vascular anomalies clinic?	88	12	0	0	0
Do you anticipate referring future patients to the clinic?	88	12	0	0	0

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