Congenital hemangiomas

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Abstract

Congenital hemangiomas are rare solitary vascular tumors that do not proliferate after birth. They are characterized as either rapidly involuting congenital hemangiomas (RICHs) or noninvoluting congenital hemangiomas (NICHs) based on their clinical progression. NICHs have no associated complications, but are persistent. RICH, while usually asymptomatic, may ulcerate or bleed early in their presentation, but involute quickly during the first few months of life. Hepatic RICHs are not associated with cutaneous RICHs, but may result in high-output cardiac failure due to arteriovenous or portovenous shunting. In the following review, the clinical characteristics and current management specific to congenital hemangiomas is discussed.

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Congenital hemangiomas (CHs) are benign vascular tumors of the neonate that have distinct clinical characteristics and a natural history which distinguishes them from classic infantile hemangiomas (IHs). CHs are divided into the two major subtypes of rapidly involuting congenital hemangiomas (RICHs) and noninvoluting congenital hemangiomas (NICHs) based on their clinical progression.

The incidence of CHs have not been well established, but they are uncommon. IHs occur in 4%-10% of Caucasian infants,[1] with CHs comprising only 3% of all hemangiomas in one series.[2] In one recent multicenter study of 594 infants, 0.3% (2/594) had a congenital hemangioma, both of which were noted to be RICHs.[3] While IHs have a strong predilection for females, CHs are thought to be evenly distributed between genders,[4-6] though NICHs may have a slight female predilection.[7]

Clinical presentation and natural history

Congenital hemangiomas are solitary in nature, presenting as round or oval vascular nodules or plaques with peripheral or central pallor and overlying telangiectasias or venules. CHs tend to be larger than IHs with an average diameter of 6 cm.[7] Similar to IHs, CHs have a period of rapid growth, but their proliferation occurs in utero,[6] and they are fully formed at birth. RICHs typically involute rapidly over the first several months of life, while NICHs persist unchanged over time, growing in proportion to the patient. This is distinct from and should not be confused with the growth characteristics of classic infantile hemangiomas, which are usually not present at birth, proliferate rapidly over the first 5-10 weeks of life, and then involute slowly over years (Figure 1).[8,9]

The distinction between RICH and NICH may not be apparent on initial clinical evaluation as morphology and histopathology of both entities can be very similar. Some authors speculate that RICH and NICH represent a clinical spectrum.[6,10] A subset of CHs, known as partially involuting CHs (PICHs), begins with rapid involution which halts prematurely.[10]

Similarly, RICH and NICH may be difficult to distinguish histologically. Both entities show lobular collections of small vessels. RICHs have interlobular fibrous tissue containing enlarged draining channels. Hemosiderin, thrombosis, focal calcification, and extramedullary hematopoiesis may be present.[11] NICHs are described as having interlobular areas containing dilated dysplastic veins and increased numbers of arteries with arteriovenous shunting. Hobnailed endothelial cells line the intralobular vessels. Mast cells are increased in NICH.[5] Staining for glucose transporter-1 protein (GLUT-1) is negative in CH and positive in IH making this a useful marker to distinguish the two entities histopathologically.[5,11]

Radiographically, NICH and RICH also show an overlap of features. Both demonstrate high flow by ultrasound (US) and magnetic resonance imaging (MRI). Compared to IHs, CHs have more heterogeneity of echostructure and visible vessels on US. While IHs do not contain calcifications, 37.5% of RICHs and 17% of NICHs showed this finding using US. By computed tomography (CT) and MRI, CHs have less well-defined edges than IHs and are more likely to show fat-stranding.[12]

The strongest link between RICH and NICH is their shared genetic basis, recently identified by Ayturk et al as an activating

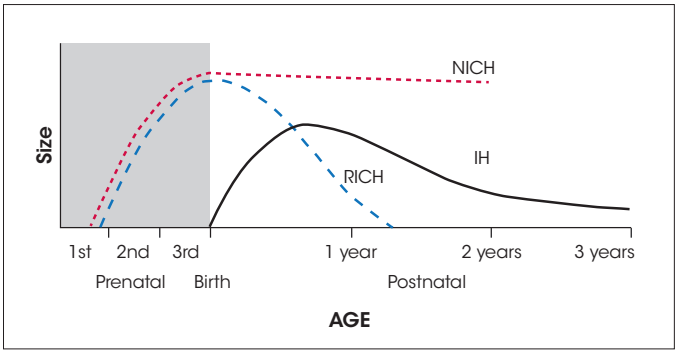

FIGURE 1. Congenital hemangioma growth curves (from Maguiness et al; 2015. © 2014 Wiley Periodicals. Reprinted with permission from Wiley Periodicals; originally adapted from Mulliken et al; 2004).[6,9]

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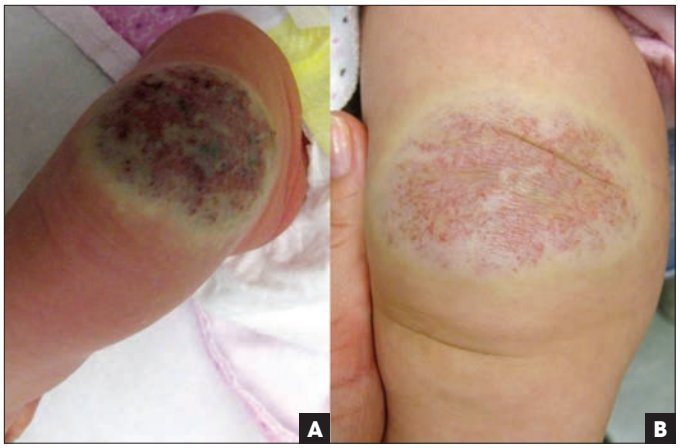

FIGURE 2. RICH. Infant with a violaceous circular plaque of the R distal thigh with peripheral pallor. Photos at **(A)** 4 weeks and **(B)** resolving by 11 weeks of age with early anetoderma.

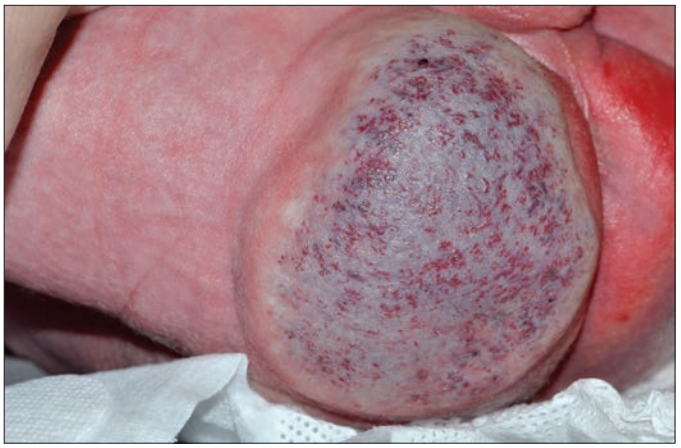

FIGURE 3. RICH. Newborn with a large exophytic nodule on the R buttocks with overlying telangiectasias. Courtesy of Dr Kristen Hook.

mutation in GNAQ or GNA11. The authors note that as both follow unique post-natal courses, additional factors must account for these differences.[13]

Rapidly involuting congenital hemangiomas

RICHs follow a pattern of early proliferation with involution either in utero or shortly after birth. RICHs form late in the first trimester and have been identified by second trimester on prenatal ultrasonography.[4,14-16] Three distinct RICH morphologies have been described: (1) a solitary purple-red exophytic nodule with overlying small venules, (2) a flat violaceous subcutaneous tumor with overlying telangiectasia, and (3) a dusky violaceous exophytic nodule with overlying telangiectasia and surrounding hyporemic halo (Figure 2, Figure 3).[4] They most commonly form on the head and neck followed by the extremities.[17]

RICHs are aptly named and demonstrate a more rapid involution period than that of classic IHs, often beginning during the first week of life. Almost all RICHs completely resolve by 14 months of age.[6] Those that involute prior to birth are known as RICH with fetal involution (RICH-FI; Figure 4).[9] Unlike IHs which resolve with fibrofatty plaques, anetodermic patches with overlying venules are the hallmark of involuted RICH and RICH-FI.[6]

Noninvoluting congenital hemangiomas

NICHs persist over time. NICHs are rarer than RICHs with only 53 cases reported during a 10-year period in 3 large vascular anomalies centers.[5] They most commonly occur on the head and neck, extremities, and trunk.[5,7] Specific sites of predilection include the mandibular border, the thigh near the knee, and the arm near the elbow.[5] Their morphology, similar to RICHs, is described as either a round or oval patch or a plaque/nodule.[7] Both subtypes have blue-purple coloration, overlying coarse telangiectasia, and peripheral or central pallor (Figure 5, Figure 6). They are warm to palpation and demonstrate elevated blood flow on bedside Doppler evaluation. NICHs grow proportionately with the patient, some developing increased protuberance or prominence of draining veins over time.[5,7] Patients may develop more symptoms during puberty or pregnancy. In one series, 43% of patients reported associated pain.[7]

Partially involuting congenital hemangioma

A small subset of CH begins a phase of involution lasting until 12-30 months of age at which time their regression halts. No further involution occurs, and like NICH, the residual vascular tumor persists lifelong.[10] The morphology of PICH is similar to that of NICH.

Complications

Congenital hemangiomas rarely cause complications. PICH and RICH-FI have no reported complications other than cosmetic disruption and rarely, early ulceration, particularly in RICH-FI. As noted, NICHs may be painful. Surgical management and/or sclerotherapy for residual prominent veins may be considered depending on the clinical situation.

Complications for RICHs occur early in their clinical course and include ulceration and bleeding. Ulceration may be very painful and interventions are generally needed to expedite healing and prevent infection. Depending on the size and location, bleeding secondary to ulceration can be life threatening, in particular with large exophytic lesions. Significant bleeding in this setting is due to both

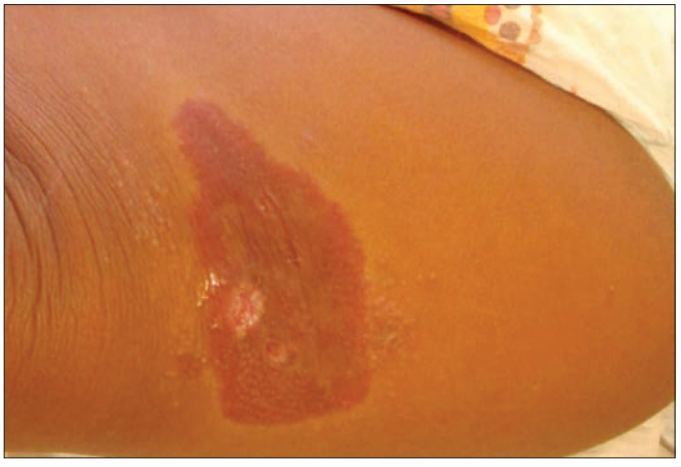

FIGURE 4. Dusky erythema with surrounding pallor in a RICH with fetal involution. Note the central atrophic areas consistent with ulcerations in utero.

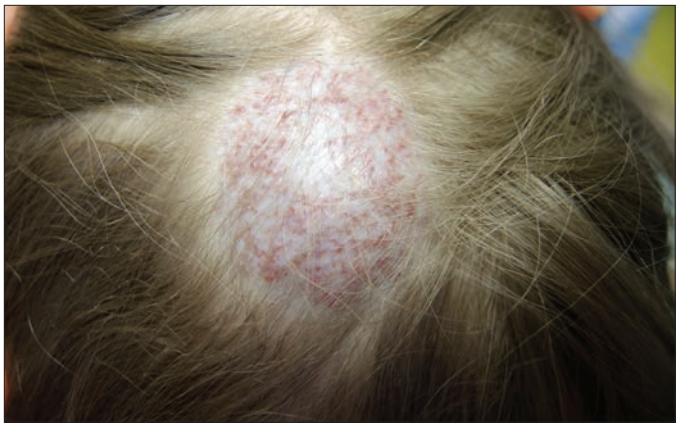

FIGURE 5. NICH of the scalp. Exam shows a blue nodule with overlying coarse red telangiectasias.

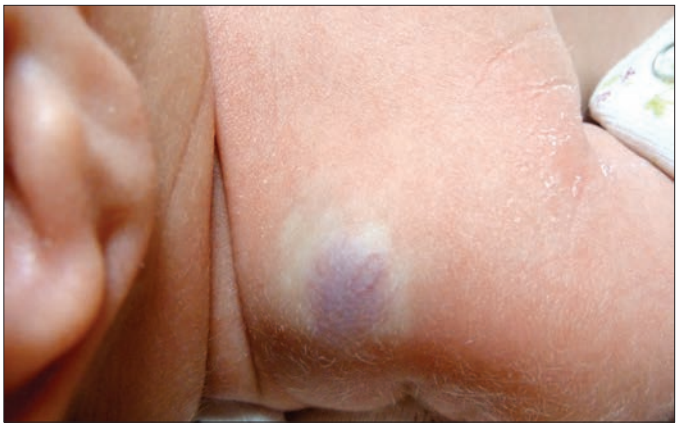

FIGURE 6. Neonate with a small NICH on the right superior shoulder presenting as a blue nodule with surrounding pallor.

high-blood flow with presence of high-flow vessels in the skin and subcutis, and also from transient platelet trapping within the tumor with resultant thrombocytopenia.[18] In these rare cases, close monitoring is required and arterial embolization may be necessary in severe or life-threatening cases. Some authors have suggested use of topical modalities, such as tranexamic acid as an adjuvant therapy in congenital hemangiomas with surface crusting to attempt to prevent ulceration and improve bleeding from these areas.[19]

Treatment

RICHs should be followed with observation and gentle skin care to prevent surface ulceration. We recommend frequent application of petrolatum-based emollients to hydrate and protect the epidermis. In the setting of bleeding or ulcerated RICH, topical tranexamic acid and/or arterial embolization may help to stop bleeding.

When RICH and RICH-FI resolve with residual overlying prominent telangiectasias, treatment with plused-dye laser or other laser modalities can be considered, as can superficial sclerotherapy. Redundant anetodermic skin may be excised to improve cosmesis.

NICH and PICH do not self-resolve. If removal is desired, surgical excision is necessary. Embolization immediately prior to excision can minimize intraoperative bleeding; however, no bleeding complications were observed in a group of 28 patients treated with excision, even when no embolization was employed.[5] NICHs rarely recur after excision.[5,7]

Hepatic rapidly involuting congenital hemangiomas

Hepatic RICHs are a distinct entity and carry a risk of life-threatening high-output cardiac failure. Hepatic RICHs are solitary and do not occur in infants with cutaneous RICHs.[20-22] Like other CHs, they may be first noted on prenatal ultrasound. Neonates with large hepatic RICHs may demonstrate the triad of hepatomegaly, high-output heart failure, and anemia.[23] Blood flow through the liver increases via arteriovenous and portovenous shunts and high flow within the RICH. Excessive flow through the hepatic circulation steals blood from cardiac circulation resulting in high-output heart failure.[21] Resultant lab abnormalities include mild anemia and thrombocytopenia from intra-RICH thrombosis, and elevated bilirubin and lactate dehydrogenase.[21] Rarely, liver failure with highly elevated transaminase levels may occur.[24] In the past, hepatic RICHs have been confused with multifcoal infantile hemangiomas. While hepatic RICHs are solitary, hepatic infantile hemangiomas are usually multifocal, mirroring their cutaneous presentation. Hepatic RICHs, like their cutaneous counterparts, involute within the first few months of life and usually need no treatment,[22] but should be followed closely with multispecialty input. If there are signs of cardiac or hepatic failure, medical management with systemic corticosteroids may be considered. Percutaneous embolization of high-flow shunts may be helpful in refractory cases.[21,22] In life-threatening cases, hepatic transplantation has been performed.[24]

Conclusion

Congenital hemangiomas are uncommon vascular proliferations of the neonate. Most involute quickly after birth (RICH) while smaller subsets either follow a course of incomplete involution (PICH) or fail to involute (NICH). RICHs may rarely ulcerate or bleed, but most CHs have no associated complications. CHs require no treatment, but may be excised with a low risk of recurrence if they are symptomatic or cosmetically bothersome. For residual lesions with prominent veins or telangiectasia, sclerotherapy or laser ablation can be considered. While hepatic RICHs share histologic features with cutaneous RICHs, they are not found concurrently in the same patient. Hepatic RICHs carry a risk of cardiac failure and liver injury and must be followed closely by a multidisciplinary team.

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