

# Hemangiomas in Children — Treatment and Removal

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**Hemangiomas are considered as the most common tumors in children and they are on the spectrum of benign vascular tumors. They can be diagnosed at birth, but are more likely to become recognized after one month of birth.**

**Hemangiomas undergo a proliferative phase which lasts between one month up to one year and an involution phase which can take years until the complete disappearance of the tumor. They can occur as red or crimson cutaneous lumps, or present with symptoms and signs suggestive of deep organ involvement. Magnetic resonance imaging is essential for the differentiation between the different types of vascular tumors, including hemangiomas. Propranolol is the first-line therapy for problematic hemangiomas. Laser surgery or excisional surgery can be used for treating large and disfiguring hemangiomas.**



## Overview

Hemangiomas are considered the **most common tumors in infants and young children**. They arise from vascular tissues and are characterized by **early proliferation**, followed by **spontaneous involution**. Hemangiomas in children can

occur on the head and neck, the trunk, the upper or lower extremities, or in the internal organs.

Most hemangiomas are medically insignificant, benign vascular tumors. Occasionally, they may impinge on certain organs, such as the respiratory tract. They may also ulcerate and bleed, causing cardiovascular compromise, or they may heal with cosmetic blemishes.

## Epidemiology of Hemangiomas in Children

Approximately 30% of hemangiomas can be **diagnosed at birth**, but most (70%) become **more evident after the first month of life**. The incidence of infantile hemangiomas in Caucasians is estimated to be around 10%. As many as 30% of preterm infants with low birth weight are diagnosed with infantile hemangiomas.

The most commonly recognized risk factors for hemangiomas include a female child, an older maternal age, maternal placenta previa or preeclampsia, and infants who are a product of multiple gestations.

Hemangiomas are **approximately 10 times more common in white infants** than African-American or Asian infants. Approximately one-third of infantile hemangiomas are recognized at birth, while the remaining two-thirds appear within the first weeks of life.

The hemangiomas themselves are considered **benign vascular tumors** and are known to regress spontaneously. Despite this, hemangiomas **can cause obstructive and pressure symptoms** when they appear in vital organs and places, such as the upper respiratory tract. Additionally, very large hemangiomas can cause high-output cardiac failure due to increased vascular flow within the tumor.

Patients with **PHACE syndrome** are at an increased risk of higher morbidity and mortality. PHACE syndrome is characterized by **posterior fossa malformations within the cerebellum**, hemangiomas of the face and head, cerebral and carotid arterial lesions, cardiac malformations, and eye abnormalities.

## Pathophysiology of Hemangiomas

Infantile hemangiomas are **benign vascular tumors composed of highly proliferating endothelial cells**. During the early stages of tumor formation, the endothelial cells are not lined correctly. However, over time, they start forming blood vessels, and the tumor becomes highly vascular. The tumor usually has a **lobular structure**.

It is hypothesized that, during fetal development, a significant number of immature endothelial and pericytes can be retained within different tissues. These immature cells can proliferate and differentiate postnatally, forming hemangiomas.

During the early proliferative phase of infantile hemangiomas, **several proliferation-inducing signals are produced, including a beta-fibroblast growth factor, vascular endothelial growth factor, and proliferating cell nuclear antigen**. Once a significant number of endothelial cells become abundant within the involved tissue, other cells, such as mast cells and myeloid cells, are attracted to the tumor.

The mast cells and myeloid cells produce **tissue inhibitors of metalloproteinases, interferon, and transforming growth factor**. They work collectively to terminate

endothelial cell proliferation and can induce tumor involution.

## Clinical Presentation of Hemangiomas in Children

The first sign of a cutaneous hemangioma is skin blanching. **Telangiectasias, followed by red or crimson macules,** usually appear in the involved skin region. Ulceration of the involved skin might precede a hemangioma's appearance.



Small hemangioma on the scalp of a two year old female.

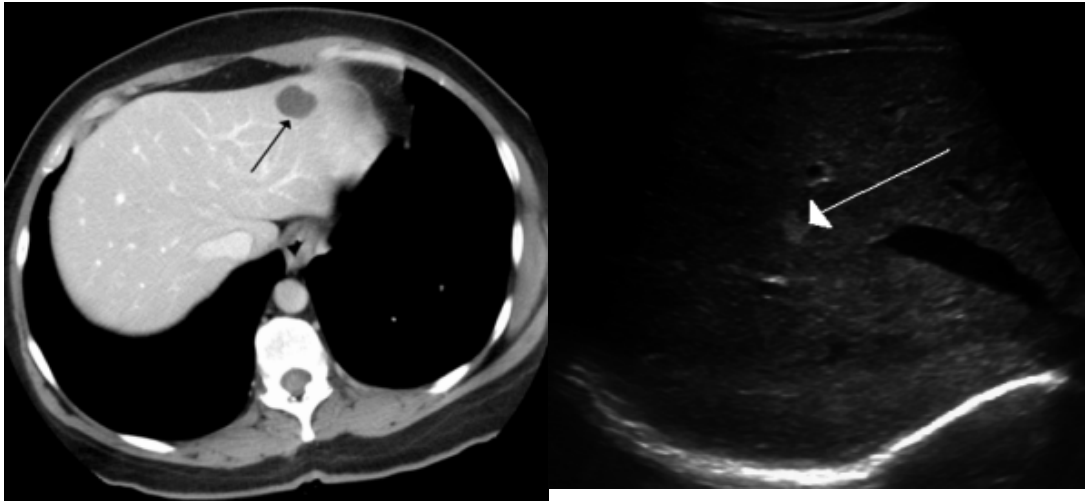


Hemangioma on forehead of a six year old boy.



Hemangioma

Hemangiomas usually grow much faster than the infant's growth rate. They **usually appear as skin lumps that are red or bluish in color.** Cutaneous hemangiomas are **most commonly found on the head and neck,** followed by the trunk and, least likely, on the upper and lower extremities. Hemangiomas can also involve the liver, lungs, or other deep organs. Hemangiomas within the liver can become large, causing symptoms and signs suggesting congestive heart failure due to increased cardiac output.



[Image](#): "A liver hemangioma." by James Heilman, MD. License: [CC BY-SA 3.0](#)

[Image](#): "Hemangioma of the liver as seen on ultrasound." by James Heilman, MD. License: [CC BY-SA 3.0](#)

Hemangiomas can also **involve the central nervous system**. Children with central nervous system hemangiomas can **present with seizures or focal neurological signs** that are progressive and correlate with the tumor's proliferative phase, which usually lasts between one month after birth up to 12 months after birth.

Pressure and obstructive symptoms of hemangiomas include stridor or difficulty breathing. Blurred vision can occur with retinal hemangiomas.

## Diagnostic Workup for Hemangiomas in Children

The same factors regulating tumor proliferation and differentiation can also be **used to assess the tumor's degree of proliferation and determine the current phase** of the tumor's 'early proliferative phase versus the involution phase'. The measurement of serum vascular endothelial growth factor and urinary beta fibroblast growth factor levels might correlate with tumor proliferation. Matrix metalloproteinases, which are secreted by the recruited myeloid cells, usually increase once the tumor becomes well-differentiated and when the involution phase starts.

When cutaneous tumors are removed surgically, it is beneficial to **differentiate between hemangiomas and other vascular tumors**. Glucose transporter 1 (GLUT-1) stain is positive in proliferating and involuting hemangiomas but negative in other vascular tumors.

Before surgical planning to remove cutaneous or internal hemangioma, **adequate imaging of the tumor is indicated** for proper delineation of the tumor's margins and extent. **Magnetic resonance imaging (MRI)** is the preferred imaging modality for evaluating infantile hemangiomas. MRI with intravenous gadolinium can help differentiate between proliferating and involuting hemangiomas. Proliferative hemangiomas might resemble high-flow vascular lesions, such as arteriovenous malformations, while involuting hemangiomas can resemble low-flow vascular lesions, such as venous malformations.

**Ultrasonography can also differentiate between hemangiomas and other liver**

**tumors**, such as liver cysts, but is not helpful in delineating the tumor's extent. **Arterial Doppler can be used to visualize increased blood flow to the tumor.**

Children presenting with breathing difficulties or stridor should undergo **chest and neck x-ray imaging**. This technique is fast and reliable in excluding upper airway obstruction.

## Treatment of Hemangiomas in Children

Hemangiomas that are small and do not cause any other symptoms to the child should be **left untreated because of the very high probability of spontaneous involution**. If left untreated, 50% of infantile hemangiomas undergo complete involution by the age of 5 years, 70% by the age of 7 years, and 90% by the age of 9 years. When hemangiomas become symptomatic or problematic to the child or her or his caregivers, medical therapy might be warranted.

The first-line medical therapy for hemangiomas in children is the **beta-blocker propranolol**, which has been found to induce involution of infantile hemangiomas. **Corticosteroid** therapy may be considered in patients for whom beta-blockers are contraindicated. Other agents with antiangiogenic properties include vincristine and interferon.

When medical treatment for symptomatic hemangiomas is initiated, **the child must be monitored closely**. Infants should be evaluated for possible cardiovascular abnormalities, the dosing frequency should be adjusted on an individual basis, and care must be taken to prevent hypoglycemia. The deleterious effects of hypoglycemia on the developing brain outweigh the benefits of treating hemangioma in some children, especially ones that are small and mildly problematic.

**Laser surgery can be used to treat proliferating or involuting hemangiomas** in children with excellent results. Pulsed-dye laser surgery is effective in children with ulcerating hemangiomas. Laser surgery should be repeated every two to four weeks until the hemangioma is healed completely.

Children with confirmed involuting hemangiomas might benefit from **non-ablative fractional photothermolysis therapy**. This technique helps with the common skin residue that can be seen after spontaneous involution of the tumors.

**Surgical excision of hemangiomas should be limited to large, slowly involuting tumors**. Early proliferative tumors carry a significant risk of hemorrhage if they are excised surgically. The main benefit of surgical excision of the tumors, as opposed to laser or medical therapy, is the availability of biopsy tissue to confirm the diagnosis.

## Complications

Hemangiomas may **ulcerate** and bleed, either superficially or deep within the structures. **Massive bleeding** may lead to high output failure, while ulceration may expose wound sites that become **infected**.

Enlarging hemangiomas may cause obstruction, such as in the respiratory tract, which causes **difficulty in breathing**. The obstruction of the visual pathway may lead to **amblyopia**.

Hemangiomas are also associated with post-operative **cosmetic blemishes**, especially for facial lesions involving the lips and nose.

## References

Antaya RJ. Infantile Hemangioma. Practice Essentials, Background, Pathophysiology. <http://emedicine.medscape.com/article/1083849>. Published January 10, 2017. Accessed March 22, 2017.

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