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A Review On Hemangioma Disease

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Abstract:

Hemangiomas are growths that happen in babies. They happen when certain cells in their blood vessels grow too fast at first and then shrink over time. Other problems with blood vessels in babies are called malformations, and they happen because the blood vessels didn't develop correctly. These malformations have cells that keep growing and don't shrink. Hemangiomas are the most common growths that babies get, and they have two phases: growing and shrinking. They are more common in white babies than black ones, and they affect girls more than boys, with three girls getting them for every one boy. *Index Terms* - Component, formatting, style, styling, insert.

Keywords-Hemangioma,

I. INTRODUCTION

Hemangioma, a common tumor in babies (about 10-12% of them), often shows up on their heads and necks (about 60% of the time). Most of these growths are solitary, meaning there's just one (80% of cases), and they tend to affect more girls than boys (about three girls for every one boy)¹.

These hemangiomas mostly appear in soft tissues like the skin, mucosa (the inner lining of some body parts), and muscles. There are only a few cases where they show up inside bones. Usually, you'll notice these growths shortly after a baby is born, although in some cases, they might already be there at birth (about 30% of the time). They tend to grow a lot during the baby's first year and then start to shrink during their childhood (up to about 12 years old). People used to classify these growths as capillary or cavernous hemangiomas, but nowadays, it makes more sense to describe them based on how deep they are in the skin: superficial, deep, or compound hemangiomas. Knowing how hemangiomas change over time helps decide when and how to treat them. Some experts say you can just leave them alone (this is called "benign neglect"), but in some cases, this isn't a good idea considering how these growths can evolve. Instead, it's better to manage them based on whether they're growing (proliferative) or getting smaller (involutive), their depth (superficial, deep, or compound), and how they might affect a person's appearance. There are several ways to treat hemangiomas, including surgery, using sclerosing agents that are injected into the growth, lasers, or even steroids given through the bloodstream. The choice of treatment depends on the specific situation.³⁻⁵. Hemangiomas, sometimes known as "strawberry marks," are the most common non-harmful tumors that babies can have. They happen because certain cells in our blood vessels start multiplying too much. There are two types of these growths: some show up right when a baby is born (we call them "congenital hemangiomas"), and others pop up a bit later in a baby's life (these are called "infantile hemangiomas")².

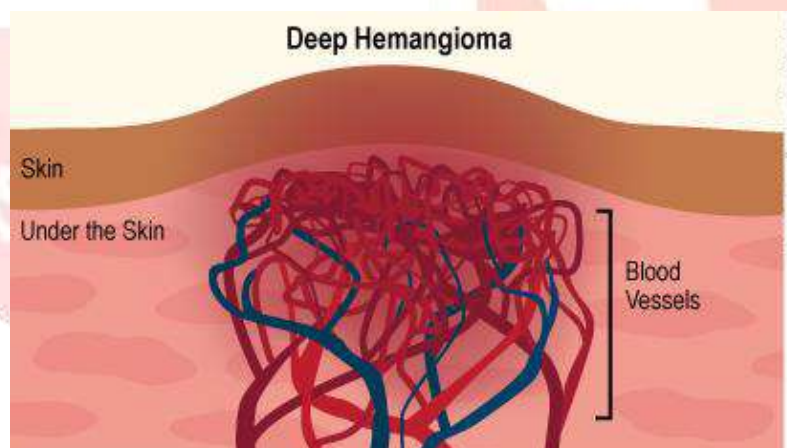
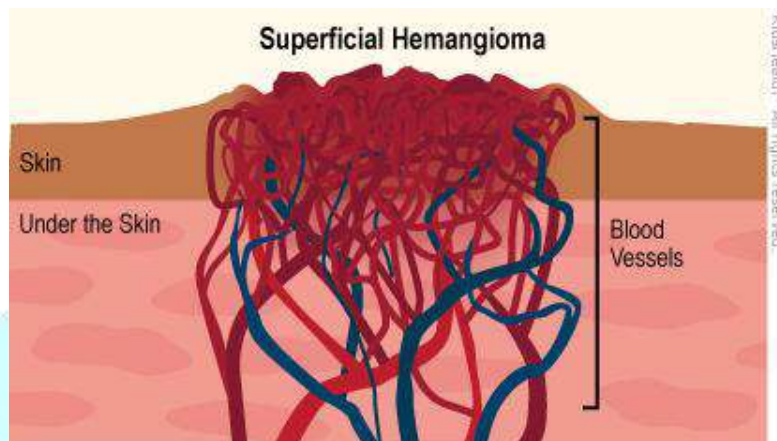
The cool thing about these hemangiomas is that they grow really fast at first and then, without any special treatment, they slowly start getting smaller all on their own. So, even though they can look a bit like strawberries, they're usually harmless and go away with time.

TYPES OF HEMANGIOMA

Different Kinds of Hemangiomas

Hemangiomas can show up anywhere on the body, and some kids might even have more than one. They mainly come in three flavors:6

1. Superficial (hanging out on the skin's surface): At first, they seem flat, but then they turn into these bright red spots with a bumpy surface, kind of like a tiny mountain range on your skin.
2. Deep (hiding under the skin): These ones look like bluish-purple bumps beneath the skin, and they feel smooth when you touch them.
3. Mixed: Now, these are a bit of a combo deal. They're like a mixtape of hemangiomas, having both the flat, bumpy surface and the bluish-purple depth going on.



CLASSIFICATION OF HEMANGIOMAS

Sorting out vascular neoplasms, which are basically unusual growths in your blood vessels, has always been a bit of a puzzle. Not long ago, experts tried to classify these growths based on a mix of how they looked, what they showed on X-rays, and what they seemed like under a microscope. They couldn't agree much on how to classify them properly. But here are some of the ways they've tried:

1. The "David I Abramson" Way (1962)7:
 - Capillary hemangioma (think of it like a strawberry mark)
 - Cavernous hemangioma
 - A mix of cavernous and capillary angioma
 - Hypertrophic or angioblastic hemangioma
 - Racemose hemangioma
 - Port-wine stain or nevus vinosus
 - Spider angioma (sounds like a spider-related name, right?)
 - Nevus flammeus (also known as DeMorgan's spot)

- Systemic hemangiomatosis (kind of like an infectious hemangioma)
- Special regional hemangiomas in various body parts, like the brain, tongue, gut, liver, muscles, and bones.
- And, some conditions where the growths come along with other issues, like neurofibromatosis and tuberous sclerosis.

2. The "Shafer et al" Approach (1993):

- Capillary hemangioma
- Cavernous hemangioma
- Angioblastic or hypertrophic hemangioma (when they get all big)
- Racemose hemangioma
- Diffuse systemic hemangioma (when it's spread out in your body)
- Metastasizing hemangioma (when it spreads like wildfire)
- Nevus vinosus or port-wine stain (like wine spilled on your skin)
- Hereditary hemorrhagic telangiectasis (a mouthful, but it means a family thing where blood vessels aren't quite right).

3. The "WHO" Way (1996)8:

- Benign (not harmful)
- Papillary endothelial hyperplasia (fancy name for some overgrowth)
- Hemangioma
- Capillary hemangioma
- Cavernous hemangioma
- Venous hemangioma (vein-related)
- Epithelial hemangioma (when it's mixed up with some other stuff)
- Pyogenic granuloma (sounds like an explosion, but it's not)
- Acquired tufted hemangioma (another name for angioblastoma)
- Lymphangioma (lymph vessel growth)
- Lymphangiomyoma, lymphangiomyomatosis, angiomatosis, lymphangiomatosis (a bunch of tongue-twisting names).

4. The "Christopher DM Fletcher" Way (2003)9:

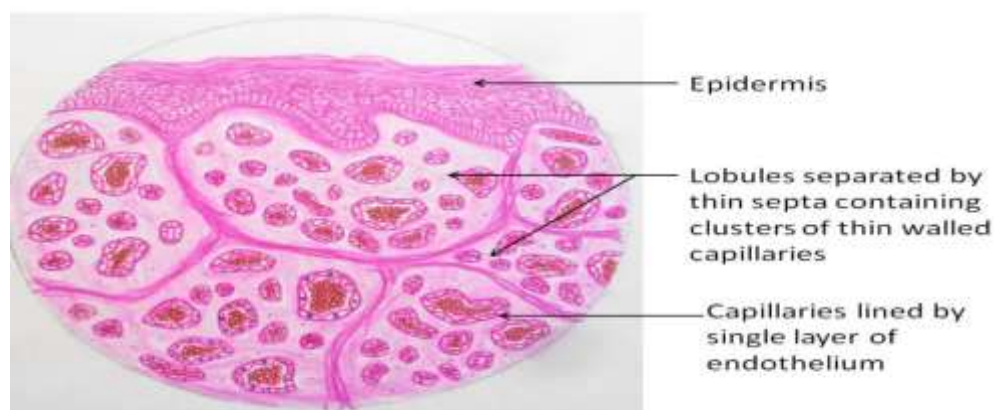
- Hemangioma
- Capillary hemangioma
- Variants (when they mix it up)
- Tufted angioma
- Verrucous hemangioma (a bumpy one)
- Cherry angioma (not related to cherries)
- Lobular hemangioma (like little lobes)
- Cavernous hemangioma
- Variants (when they come in different flavors)
- Sinusoidal hemangioma
- Arteriovenous hemangioma
- Variants (more different kinds)
- Superficial (like a bulging blood vessel)
- Deep (going deeper inside)
- Microvenular hemangioma (tiny veins)
- Targetoid hemosiderotic hemangioma (a bullseye one)
- Epithelioid hemangioma (mixed up with other stuff)
- Venous hemangioma
- Spindle cell hemangioendothelioma (spiky cells)
- Deep hemangiomas
- Variants
- Intramuscular, synovial, neural, nodal (in different parts of the body)
- Angiomatosis (when it's all over the place).

So, as you can see, there are quite a few ways to try and make sense of these tricky blood vessel growths!

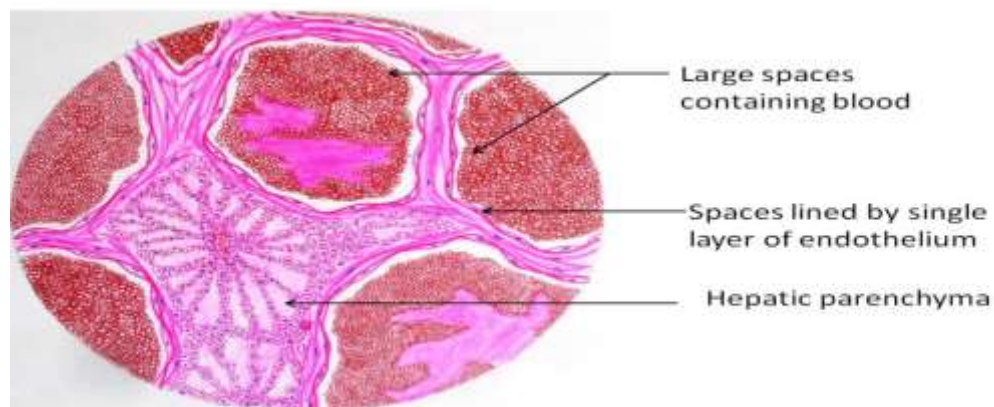
Capillary

Hemangioma

Capillary Hemangioma



Cavernous Hemangioma



HISTORY OF HEMANGIOMA ACCORDING TO RESEARCH

Hemangioma, a vascular tumor characterized by an abnormal overgrowth of blood vessels, has a history that spans centuries. Understanding its history according to research provides insights into how our knowledge of the disease has evolved over time:

Early Observations (Ancient Times):- Hemangiomas have likely existed for centuries, but early civilizations had limited understanding of the condition.

- Ancient medical texts from various cultures, such as the Greeks and Egyptians, do not specifically describe hemangiomas, but they may have been mentioned indirectly in discussions of skin abnormalities.

2. 19th Century Recognition:

- The first systematic description of hemangiomas came in the 19th century. German pathologist Friedrich von Waldeyer-Hartz, in 1863, provided one of the earliest documented descriptions of these growths.¹⁰

3. Rudolf Virchow's Contributions (Late 19th Century):

- Renowned German pathologist Rudolf Virchow, in the late 19th century, made significant contributions to the understanding of hemangiomas.
- He coined the term "angioma" to describe vascular tumors, which encompass hemangiomas.¹¹

4. 20th Century Advances:

- In the early 20th century, advances in medical knowledge and technologies allowed for a more precise classification of hemangiomas.
- Dr. John Fraser published an influential monograph on hemangiomas in 1903, helping to establish the basis for modern classification and understanding.¹²
- Histological studies in the mid-20th century contributed to distinguishing different types of hemangiomas based on the size and arrangement of blood vessels.

5. Propranolol Discovery (2008):

- A significant breakthrough in the treatment of infantile hemangiomas came in 2008 when researchers discovered the effectiveness of propranolol, a common heart medication, in reducing the size and proliferation of these tumors.

- This discovery revolutionized the management of infantile hemangiomas, offering a less invasive and more effective treatment option than surgical intervention.¹³

6. Advancements in Genetics and Molecular Research:

- In recent decades, genetic and molecular studies have shed light on the underlying causes of hemangiomas.

- Researchers have identified certain genetic mutations and signaling pathways that contribute to the development of hemangiomas, leading to potential targeted therapies in the future.

7. Current Research and Therapies:

- Ongoing research continues to improve our understanding of hemangiomas, including their natural history, genetics, and optimal treatment approaches.

- Therapeutic options have expanded beyond propranolol to include other medications and minimally invasive procedures.

In summary, the history of hemangioma disease has evolved from early observations and rudimentary descriptions to a deeper understanding of its classification, genetics, and treatment. Advances in medical research have transformed the management of this condition, offering hope for better outcomes and a higher quality of life for those affected by hemangiomas.

NATURAL HISTORY OF HEMANGIOMA

The natural history of hemangioma typically follows a triphasic evolution, meaning it progresses through three distinct phases over time. These phases are¹⁴:

1. Proliferative Phase (Infancy):

- This is the initial phase that occurs soon after birth, although some hemangiomas may be present at birth.

- During this phase, the hemangioma grows rapidly and can become more prominent in size and color.

- It is often characterized by a bright red appearance and a raised, bumpy texture, resembling a strawberry in some cases.

- The proliferative phase is the most active stage of growth, usually occurring within the first few months of life.

2. Plateau Phase (Childhood):

- After the proliferative phase, the hemangioma enters a relatively stable period known as the plateau phase.

- During this phase, the growth of the hemangioma slows down or stops altogether.

- The color may change from bright red to a deeper purple or bluish hue.

- Although the hemangioma remains visible, it does not grow as rapidly as it did during the proliferative phase.

- The duration of the plateau phase can vary from months to several years.

3. Involution Phase (Childhood to Adolescence):

- The involution phase is the final stage in the natural history of hemangioma.

- During this phase, the hemangioma gradually starts to shrink and fade away.

- The color becomes paler, and the raised, bumpy texture smoothens out.

- Some hemangiomas may completely disappear during this phase, while others leave behind residual skin changes or discoloration.

- The involution phase can extend into childhood and adolescence, and it may take several years for the hemangioma to fully resolve.

It's important to note that not all hemangiomas follow this triphasic evolution precisely, and there can be variations in the duration and intensity of each phase. Additionally, the natural history of hemangiomas can be influenced by factors such as the size, location, and individual characteristics of the patient. As a result, some hemangiomas may require medical intervention or treatment during the proliferative phase if they pose risks or complications.

DEMOGRAPHICS

The demographics of hemangioma disease, which refers to the characteristics and distribution of the condition within different populations, can vary based on several factors:

1. Age:

- Hemangiomas are most commonly seen in infants and young children, with the majority appearing within the first few weeks or months of life.
- They often grow rapidly during the first year of life and then begin to regress, with many resolving by adolescence.^{15,16,17}

2. Gender:

- Hemangiomas are more prevalent in females than in males, with a female-to-male ratio of approximately 3:1.¹⁸

3. Ethnicity:

- Hemangiomas can occur in individuals of all ethnic backgrounds. There is no significant racial or ethnic predilection for the condition.

4. Location:

- Hemangiomas can develop on various parts of the body. The head and neck region is the most common site, accounting for around 60% of cases. However, they can appear on other areas such as the trunk, limbs, or internal organs.^{19,20}

5. Prematurity:

- Premature infants have a higher risk of developing hemangiomas. These growths may appear earlier and have a more severe course in premature babies.

6. Family History:

- There is evidence suggesting a genetic predisposition to hemangiomas in some cases. A family history of hemangiomas may increase the likelihood of a child developing one.

7. Multiplicity:

- Some individuals may have more than one hemangioma, and this multiplicity can vary widely. Multiple hemangiomas may occur as isolated cases or as part of certain syndromes.

8. Complications:

- Hemangiomas may cause complications such as ulceration, bleeding, or interference with vision, breathing, or feeding, depending on their size and location.

9. Associated Syndromes:

- Hemangiomas can be associated with specific syndromes, such as PHACE syndrome, Kasabach-Merritt syndrome, and others, which can have their own demographic characteristics and clinical features.

It's important to note that while these demographics provide a general overview, each case of hemangioma is unique.

ETIOLOGY

The cause of hemangiomas is not completely understood, but it likely involves a mix of genetic and environmental factors. Genetics may play a role since a family history of hemangiomas can increase the risk. Abnormal growth of blood vessel lining cells (endothelial cells) contributes to hemangioma formation.

Hormones, especially estrogen, may influence hemangioma development, as they are more common in girls and can grow quickly in infancy when estrogen levels are high. Premature birth is also a risk factor, possibly due to hormonal changes.

Placental issues and immune system responses may be linked to hemangiomas, and there's ongoing research into environmental triggers like pregnancy-related trauma. Hemangiomas are vascular tumors involving the formation of new blood vessels, and their exact causes remain a subject of study.

Every hemangioma case is unique, varying in size and location, and treatment is tailored to each patient's needs.

EPIDEMIOLOGY

Hemangioma is a common condition in infants, with around 4% to 5% of newborns affected.²¹ It usually shows up shortly after birth or within the first few months of life. Girls are more likely to have hemangiomas than boys, with a ratio of 3 to 1. This condition doesn't show a preference for any specific race or ethnicity, affecting people from diverse backgrounds.

Hemangiomas can appear all over the body, but they're often found on the head and neck (about 60% of the time). Some people may have multiple hemangiomas, and these growths can be associated with certain

syndromes. Treatment approaches have evolved, with options like propranolol, and the age at which hemangiomas naturally fade can vary widely, from childhood to several years.²²

This understanding of hemangioma's epidemiology helps healthcare professionals and researchers better diagnose and manage the condition and plan for public health needs.

HISTOPATHOLOGY OF HEMANGIOMA

When examining tissue samples of hemangioma under a microscope, distinct features emerge to help diagnose and classify it.²³ These features include an abundance of various-sized blood vessels, rapidly multiplying endothelial cells lining the vessels, clusters of these cells forming nodules, and the development of small cavities (lumens) filled with blood.²⁴

Hemangiomas may also contain fibrous tissue for structural support and may be accompanied by inflammatory cells like lymphocytes and histiocytes. They can exhibit different stages of maturation, from active growth to less active phases, and may even show signs of reduction (involution) in later stages. Some special types of hemangiomas have unique characteristics that set them apart.

Immunohistochemistry, using markers like CD31 and CD34, can further refine the diagnosis. This histopathological examination is vital for confirming hemangioma, distinguishing it from other vascular conditions, and guiding treatment decisions.

IMAGING FEATURES HEMANGIOMA

Imaging techniques are vital for understanding and managing hemangiomas. Here's a simplified look at how they help:

1. Ultrasound: It's often the first choice, especially for infants. Hemangiomas appear as darker masses with increased blood flow seen through color Doppler.
2. MRI: Great for detailed views, especially in deeper tissues. Hemangiomas show up as well-defined masses with varying signals. After contrast, they have a "fast-filling, slow-emptying" pattern.²⁵
3. CT: Sometimes used when MRI isn't an option. Hemangiomas look like well-defined masses with lower-density centers due to their vascular spaces.
4. Angiography: Rarely used but detailed. Hemangiomas have a unique "moth-eaten" appearance due to irregular blood vessel distribution.²⁶
5. Nuclear Medicine: For specific types, like thyroid hemangiomas, a radioactive tracer can reveal increased uptake.
6. 3D Reconstruction: In complex cases, 3D techniques help visualize the exact size and location of hemangiomas.

These imaging methods are crucial for diagnosis, sizing, assessing blood flow, and guiding treatment, depending on the patient's age and the hemangioma's location.

MANAGEMENT

Kane and colleagues²⁷ developed a practical approach to managing these tumors. Initially, a thorough assessment, including a medical history and physical examination, is conducted. An MRI is then performed to assess the tumor's extent, as its full reach may not be obvious during the examination. If signs like bruits or deep extension are present, angiography can be valuable. For hemangiomas, it's essential to determine if the lesion is actively growing. If so, observation or steroid treatment are options. For non-growing lesions, assessing whether they are involuting is crucial. Involuting lesions can be managed through observation.

Dealing with vasoformative tumors can be quite a puzzle, as they can lead to various issues, from minor bleeding and swelling to severe bleeding and airway problems. Managing these tumors hinges on factors like their size, where they're located, how they're behaving, and the patient's age. Typically, hemangiomas are handled with a conservative approach, especially considering their tendency to naturally regress.

The majority of genuine hemangiomas don't need any action, but around 10 to 20% do require treatment due to factors like their size, where they're situated, or how they behave.²⁸

Tailored treatment depends on the patient's age, the lesion's size and location, its growth or regression stage, and functional impact. Small hemangiomas that don't affect function are typically observed. This involves regular check-ups, parental support, and documenting progress with photos. For capillary hemangiomas, natural involution often yields better results than surgical removal. Surgery may be considered, especially when function is at risk. The main medical treatments include steroids and beta-blocker therapy.^{29,30,31}

Steroids are now a key part of treating growing hemangiomas in kids. The primary approach involves using high doses of steroids either systemically or directly into the lesion. Remarkably, around 30% of patients experience a striking improvement as a result.³²

Fost and Esterly were the pioneers in employing systemic steroids for hemangioma treatment. They administered Prednisone at doses ranging from 20 to 30 mg per day for periods spanning 2 weeks to 4 months. The results were quite promising, with both patients having capillary hemangiomas showing significant improvement, and three out of four patients with mixed hemangiomas also responded positively.³³

Fost suggested discontinuing treatment if there was no improvement within two weeks. This was due to the numerous side effects that systemic steroids can have on infants.

Edgerton also recommended using systemic steroids for hemangiomas. He monitored seven patients who were given daily doses of 20 to 40 mg of prednisone for periods ranging from 30 to 90 days. Notably, all of these patients experienced a clear and positive response to the treatment.³⁴

While interferon alfa has proven effective in treating hemangiomas in various studies, it's important to note that there is a concern about the increased risk of spastic diplegia. This risk often leans towards considering alternative treatments.

In their study, Blei and colleagues administered interferon alfa-2a to treat parotid hemangiomas, involving 13 females and 1 male. Unfortunately, the results were disappointing, showing limited effectiveness.³⁵

Greinwald and colleagues conducted a well-structured study. They carried out a prospective randomized trial, involving 24 patients who had severe or life-threatening hemangiomas situated in the head and neck area.³⁶

Treatment for oral hemangiomas has advanced over time. While complete surgical removal offers the best chance of curing these lesions, it often involves sacrificing a significant amount of tissue due to their size. For instance, dealing with tongue hemangiomas might require near-total removal of the tongue, causing severe functional issues like difficulty in swallowing, speaking, and maintaining an open airway. To reduce functional impairments and the complications of surgery, various additional techniques have been introduced. One common approach is embolotherapy, which involves blocking blood vessels with foreign materials. As interventional radiology techniques improve, more options become available for treating vascular malformations and hemangiomas in the head and neck region. This approach has a historical basis, dating back to the early 1900s when similar techniques were employed to treat head and neck tumors, marking significant progress in medical intervention.

Laser therapy is now a popular choice for hemangioma treatment. Advanced lasers allow for precise targeting, avoiding unnecessary tissue damage. Specifically, yellow light lasers in the 578-585 nm range are great for this purpose, as they get absorbed mainly by hemoglobin, with melanin being the only other substance that might absorb them. These lasers can work well on the oral mucosa since there's very little melanin in this area. They typically cause minimal to no harm to the mucosa or its outer layer. For capillary hemangiomas in the macular stage, a 585 nm pulsed dye laser has been effectively used in treatment.³⁷

Apfelberg introduced a neodymium:yttrium-aluminum-garnet (Nd:YAG) laser for the treatment of extensive hemangiomas and vascular malformations in the head and neck. This laser works by applying focused laser energy directly into the lesions to achieve photocoagulation, offering a promising treatment option.³⁵

Cryosurgery, often linked to scarring when used on the skin, is being explored for its potential in treating oral mucosal lesions. Some researchers have employed cryosurgery for oral vascular tumor treatment. However, it's worth noting that this method has become less popular in recent years.³⁸⁻⁴⁰

DIAGNOSTIC CONSIDERATION

When you're thinking about hemangiomas, there are many other possibilities in this group. It's essential to think about all of them to find the right diagnosis.

Some of these possibilities are:

1. Birthmark hemangioma (Congenital Hemangioma)
2. Red bump caused by infection (Pyrogenic granuloma)
3. Kaposiform blood vessel tumor (Kaposiform Hemangioendothelioma)
4. Knotted blood vessel growth (tufted Hemangioma)
5. Swollen veins (Venous Malformation)
6. Skin mark like a red wine stain (Capillary Malformation)
7. Large fluid-filled lymphatic swelling (Lymphatic Malformation)
8. Dangerous growths like sarcoma, skin neuroblastoma, or lymphoma.

MEDICAL FORECAST

Hemangioma prognoses vary widely based on size, location, and complications. Small ones often resolve well, but larger ones may leave scars. Rarely, they can complicate or become cancerous, requiring urgent treatment. Consulting a healthcare professional for a tailored prognosis is crucial, as early diagnosis and care can greatly affect outcomes.

COMPLICATION

Complications from hemangiomas vary depending on a patient's age and where the hemangioma is located. Here are some of the possible issues:

1. **Ulceration:** The most common problem, happening in about 10% of cases. Places like the anogenital area, lower lip, armpit, and neck are at higher risk.
2. **Eye Troubles:** Hemangiomas near the eye can lead to problems like amblyopia, astigmatism, myopia, or tear duct blockage.
3. **Breathing Issues:** Hemangiomas in the nose, throat, or windpipe can block airways.
4. **Feeding Challenges:** Lip or mouth hemangiomas might make feeding difficult.
5. **Internal Involvement:** Sometimes, multiple skin hemangiomas, especially more than five, can signal problems in the liver or digestive system.
6. **Appearance Changes:** Large facial hemangiomas or those on the nose, ears, or around the mouth can affect how someone looks.
7. **Syndromes:** Special types of hemangiomas, like PHACES or LUMBAR, can come with other health issues related to the brain, heart, eyes, or other body parts.

These complications can vary in severity, so it's crucial to talk to a healthcare provider to understand and manage them effectively.

CONCLUSION

In conclusion, hemangiomas are common vascular growths that appear in infants and young children. While they can be a source of concern for parents and caregivers, most hemangiomas are benign and resolve on their own without causing significant health issues. The exact cause of hemangiomas is still not fully understood, but they are thought to result from abnormalities in blood vessel development during fetal development.

The characteristic appearance of a hemangioma, often described as a "strawberry birthmark" or "cherry angioma," includes a red or pinkish color and a raised or bumpy texture. These growths can vary in size, shape, and location on the body. It's important to note that hemangiomas typically go through a growth phase during the first several months of life, followed by a regression phase where they gradually shrink and fade.

Diagnosis of hemangiomas is usually based on their appearance during a physical examination by a healthcare provider. In some cases, imaging tests may be used to assess the hemangioma's size and depth, particularly if it is located near vital structures.

Treatment of hemangiomas depends on various factors, including their size, location, and the presence of symptoms. In many cases, no treatment is necessary, and the hemangioma will resolve on its own over time. However, medical intervention may be considered if the hemangioma poses functional impairment, ulceration, infection risk, or significant cosmetic concerns. Treatment options can include oral medications, laser therapy, surgical removal, or propranolol.

Parents and caregivers of children with hemangiomas should work closely with healthcare professionals to determine the most appropriate management plan for their child. Regular monitoring is often recommended to track the hemangioma's progress and ensure timely intervention if needed.

In summary, while hemangiomas can be a source of worry for parents, most cases do not require aggressive treatment, and the majority resolve without complications. Seeking guidance from a healthcare provider is essential to ensure the well-being of the child and to address any specific concerns related to the hemangioma's growth or appearance.

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