

# Hematoma

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## Hematoma

**Primary Disciplinary Field(s):** Medicine, Pathology, Emergency Medicine, Traumatology

### 1. Core Definition

A **hematoma** is fundamentally defined as a localized collection of blood outside of blood vessels, typically in a clotted or partially clotted state, within an organ, tissue, or body space. Unlike a simple contusion or bruise, which involves capillary leakage into the interstitial spaces, a hematoma signifies a more substantial accumulation of blood, often resulting from the rupture of larger blood vessels. This accumulation forms a distinct swelling or mass that can exert pressure on surrounding tissues and structures. The presence of a hematoma is a clear indication of internal bleeding, which can range in severity from minor and self-resolving to life-threatening, depending largely on its size, location, and the rate of blood accumulation.

The formation of a hematoma is a direct consequence of an accident or injury, as specified in the source content, involving trauma that breaches the integrity of blood vessel walls. This leakage of blood is contained within a specific area, forming a visible or palpable swelling. The body's natural hemostatic mechanisms, including platelet aggregation and the coagulation cascade, work to clot the extravasated blood, often encapsulating it within surrounding tissues. Over time, the clotted blood undergoes a process of resorption, changing in color and consistency as hemoglobin breaks down, eventually leading to the resolution of the swelling, though this can take days, weeks, or even months depending on the hematoma's initial volume.

### 2. Etymology and Historical Development

The term "hematoma" originates from ancient Greek, combining "haima" (αἷμα), meaning **blood**, and "oma" (ωμα), which denotes a **tumor**, **mass**, or **swelling**. This etymology accurately reflects the condition as a blood-filled mass. The concept of localized blood collections following trauma has been recognized in medical practice for millennia, with ancient civilizations observing and attempting to treat such swellings. Early physicians, including Hippocrates, described various forms of swellings and injuries involving blood, though their understanding of internal physiology and specific vessel rupture was rudimentary.

Over centuries, as anatomical and physiological knowledge advanced, particularly from the Renaissance onwards, the understanding of hematomas became more precise. The advent of surgical techniques allowed for the direct observation and treatment of these collections. The development of diagnostic tools in the 20th century, such as X-rays, and later, advanced imaging techniques like computed tomography (CT) scans and magnetic resonance imaging (MRI), revolutionized the ability to accurately locate, size, and monitor hematomas, especially those in

critical areas like the brain. This evolution in understanding and diagnostics has profoundly impacted the management and prognosis of patients suffering from these blood collections.

### 3. Pathophysiology and Causes

The pathophysiology of a hematoma begins with damage to blood vessel walls, which can be caused by various mechanisms. As stated in the source, **direct blows** or any form of **tearing of muscle tissue** are primary culprits. This physical trauma leads to the rupture of capillaries, venules, arterioles, or even larger arteries and veins, allowing blood to extravasate into the surrounding interstitial space. Once blood leaves the vascular system, it begins to clot, forming a localized mass. The size and rate of expansion of the hematoma depend on the size of the damaged vessel and the pressure within it, as well as the surrounding tissue's ability to contain the blood.

Beyond direct blunt force trauma or muscle tears, other common causes include surgical procedures where blood vessels may be inadvertently damaged or inadequately ligated, leading to postoperative hematoma formation. The use of anticoagulant medications (blood thinners) significantly increases the risk and severity of hematomas, as they impair the body's natural clotting mechanisms, allowing blood to leak more extensively. Underlying medical conditions, such as coagulation disorders (e.g., hemophilia), vascular malformations, aneurysms, or even severe hypertension, can also predispose individuals to spontaneous hematoma formation or exacerbate those resulting from minor trauma.

The body's response to a hematoma involves inflammation and subsequent resorption. Macrophages and other immune cells are mobilized to clear the clotted blood and cellular debris. The breakdown of hemoglobin within the hematoma leads to the characteristic color changes observed in bruises, progressing from red/blue to purple, green, and yellow over several days to weeks. While most hematomas resolve spontaneously, larger collections or those in critical locations may persist, requiring medical intervention due to continued pressure effects, risk of infection, or compromise of organ function.

### 4. Types and Locations

Hematomas are classified based on their location within the body, which critically dictates their clinical significance and potential for complications. The source explicitly mentions the concern when a hematoma is "contained within the skull (such as a **subdural hematoma**)," highlighting the particular danger posed by intracranial bleeding due to the rigid confines of the skull.

Key types of hematomas include:

**Subdural Hematoma:** A collection of blood between the dura mater and the arachnoid membrane,

typically resulting from tears in bridging veins. These are often associated with head trauma and can be acute, subacute, or chronic, with chronic forms being more common in the elderly.

**Epidural Hematoma:** Occurs between the dura mater and the skull, usually due to arterial bleeding (most commonly from the middle meningeal artery) following severe head trauma. These are often rapidly expanding and constitute a neurosurgical emergency.

**Intracerebral Hematoma:** Blood collection within the brain tissue itself, often caused by trauma, stroke (hemorrhagic type), or underlying vascular abnormalities.

**Subungual Hematoma:** A collection of blood under a fingernail or toenail, typically caused by direct crushing injury to the digit.

**Retroperitoneal Hematoma:** Occurs in the retroperitoneal space (behind the abdominal cavity lining), often associated with trauma to the abdomen, pelvic fractures, or complications of vascular procedures.

**Intramuscular Hematoma:** Blood collection within a muscle, frequently caused by significant muscle tears or deep blunt trauma.

**Subcutaneous Hematoma:** Located beneath the skin, commonly referred to as a severe bruise.

**Spinal Epidural Hematoma:** A rare but serious condition involving blood collection in the epidural space surrounding the spinal cord, which can lead to spinal cord compression and neurological deficits.

The location of a hematoma is paramount because it dictates the potential for critical complications. In confined spaces like the skull or within muscle compartments, even a relatively small volume of blood can exert significant pressure, leading to severe consequences. For example, intracranial hematomas elevate **intracranial pressure**, which can compress brain tissue, impair blood flow, and lead to permanent neurological damage or death if not promptly managed. Similarly, an intramuscular hematoma in a tight fascial compartment can lead to **compartment syndrome**, a condition where pressure compromises blood flow and nerve function within the affected limb.

## 5. Clinical Presentation and Diagnosis

The clinical presentation of a hematoma varies widely based on its location, size, and the rate of bleeding. Superficial hematomas, such as those in subcutaneous tissues, are often characterized by visible swelling, pain, tenderness to touch, and characteristic skin discoloration (ecchymosis) that evolves from red/blue to purple, green, and yellow over several days. They may also cause warmth in the affected area and some restriction of movement if they are near a joint or within a

muscle.

Hematomas in deeper or more critical locations present with symptoms related to pressure on adjacent structures. For instance, an intracranial hematoma can manifest with severe headache, nausea, vomiting, confusion, altered consciousness, seizures, focal neurological deficits (e.g., weakness on one side of the body, speech difficulties), pupil asymmetry, and potentially brain herniation. A spinal epidural hematoma might cause sudden, severe back pain, weakness, numbness, or even paralysis in the extremities. A retroperitoneal hematoma might present with abdominal pain, distension, or signs of hypovolemic shock if the bleeding is substantial.

Diagnosis typically begins with a thorough physical examination, including palpation of the affected area and assessment of neurological function if an intracranial or spinal hematoma is suspected. Imaging studies are crucial for confirming the presence, size, and exact location of a hematoma, especially when it is not superficial. **Computed Tomography (CT) scans** are often the first-line imaging modality for suspected intracranial hematomas due to their speed and ability to clearly visualize acute blood. **Magnetic Resonance Imaging (MRI)** offers superior soft tissue detail and is valuable for evaluating spinal, intramuscular, and some chronic intracranial hematomas. **Ultrasound** can be used for superficial soft tissue hematomas and to guide drainage procedures. Blood tests, including a complete blood count and coagulation profile, are often performed to assess the patient's overall condition and identify any underlying bleeding disorders or anticoagulant use.

## 6. Complications and Prognosis

The complications arising from a hematoma are diverse and depend heavily on its size, location, and the tissues it impacts. As highlighted, the most severe issues arise when hematomas are "contained within the skull," where they can cause rapid and dangerous increases in intracranial pressure. This pressure can compress vital brain structures, leading to ischemia, permanent brain damage, and potentially fatal **brain herniation**. Similar pressure effects can occur elsewhere, such as nerve compression in peripheral locations or, in the case of large intramuscular hematomas, the development of **compartment syndrome**, which can lead to irreversible muscle and nerve damage if not promptly treated.

Beyond direct pressure, other significant complications include infection, particularly if the hematoma is large, exposed to the external environment, or arises in an immunocompromised individual. A hematoma can serve as a culture medium for bacteria, leading to abscess formation, which requires aggressive antibiotic treatment and surgical drainage. Large hematomas can also cause significant blood loss, potentially leading to anemia or, in extreme cases, hypovolemic shock. Prolonged presence of a hematoma can result in fibrosis, calcification, or the formation of a pseudocyst, which may cause chronic pain or dysfunction.

The prognosis for individuals with hematomas varies widely. Small, superficial hematomas generally resolve without intervention and have an excellent prognosis. In contrast, large intracranial hematomas, especially acute epidural or subdural types, carry a high risk of morbidity and mortality, even with prompt surgical intervention. Factors influencing prognosis include the patient's age, overall health status, the rapidity of hematoma formation, the extent of associated tissue damage, and the timeliness and effectiveness of medical and surgical management. Early diagnosis and appropriate treatment are critical in mitigating complications and improving outcomes.

## 7. Management and Treatment

The management of a hematoma is determined by its characteristics, including size, location, and the presence of symptoms or complications. For many small, superficial hematomas, conservative management is sufficient. This typically involves the RICE protocol: **Rest** of the affected area, application of **Ice** to reduce swelling and pain (especially in the acute phase), **Compression** with a bandage to minimize further bleeding and swelling, and **Elevation** of the injured limb above the heart to promote venous drainage. Over-the-counter pain relievers, such as NSAIDs, can help manage discomfort, though their use might be cautioned in the very acute phase due to potential effects on platelet function.

For larger or symptomatic hematomas, particularly those causing significant pressure or functional impairment, more active medical or surgical interventions may be required. Medical management might include close observation, especially for intracranial hematomas that are small and not rapidly expanding, with serial imaging to monitor changes. In cases where the hematoma is causing severe pain or is at risk of infection, antibiotics might be considered, though this is less common. For patients on anticoagulants, reversal of anticoagulation may be necessary, depending on the urgency and risk-benefit assessment.

Surgical intervention becomes necessary when a hematoma is causing critical pressure effects, such as elevated intracranial pressure, nerve compression, or compartment syndrome. Surgical procedures aim to evacuate the clotted blood and relieve pressure. For intracranial hematomas, procedures range from burr hole trephination (creating a small hole in the skull to drain fluid) to a more extensive craniotomy (removing a section of the skull to access and remove the hematoma). Other surgical options include incision and drainage for large soft tissue hematomas, or endoscopic removal for those in less accessible areas. The goal of surgery is to decompress vital structures, prevent further damage, and facilitate recovery, though surgical risks, including infection and further bleeding, must always be considered.

## 8. Significance and Impact

Hematomas represent a significant challenge in clinical medicine, particularly in the fields of emergency medicine, traumatology, and neurosurgery. Their prevalence ranges from common, benign bruises resulting from everyday minor injuries, to highly critical and life-threatening conditions such as large intracranial hemorrhages following severe trauma. The ability to promptly recognize, diagnose, and appropriately manage hematomas is crucial for preventing severe morbidity and mortality. In emergency settings, the rapid differentiation between a simple contusion and a deeply expanding hematoma can be the difference between a minor inconvenience and a fatal outcome, particularly when the brain or major organs are involved.

The impact of hematomas extends beyond the immediate clinical presentation, affecting patient quality of life and imposing a considerable burden on healthcare systems. Patients can experience prolonged recovery periods, chronic pain, neurological deficits, and significant rehabilitation needs, especially after large or complex hematomas requiring surgical intervention. The economic impact includes costs associated with emergency care, diagnostic imaging, surgical procedures, hospital stays, medications, and long-term physical or occupational therapy. Furthermore, the psychological toll on patients and their families, particularly in cases of severe trauma or brain injury, is substantial, often necessitating psychosocial support. Continuous research into better diagnostic tools, less invasive treatment methods, and improved preventive strategies remains a vital area of medical advancement.

## Further Reading

[Hematoma - Wikipedia](#)

[Subdural hematoma - Wikipedia](#)

[Epidural hematoma - Wikipedia](#)

[Intracerebral hemorrhage - Wikipedia](#)

[Intracranial pressure - Wikipedia](#)

[Compartment syndrome - Wikipedia](#)

[Brain herniation - Wikipedia](#)