“Talk and Die Syndrome” – The Medical and Legal Consequence of an Intracranial Hemorrhage

Samuel D. Hodge Jr.
Temple University, temple885@aol.com

Jack E. Hubbard
University of Minnesota School of Medicine, jackhubb@comcast.net

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“Talk and Die Syndrome” – The Medical and Legal Consequence of an Intracranial Hemorrhage

By: Samuel D. Hodge, Jr.¹ and Jack E. Hubbard²

It was a brisk winter day as Natasha Richardson³ tested her skiing prowess on a mountain near Montreal. While gliding down the slope without a helmet, the actress fell on the soft snow and did not appear to strike her head. She declined all offers of help and appeared fine.⁴ One hour later, however, she developed a severe headache and was taken to a local hospital. Forty-eight hours later, she died from an epidural hematoma.⁵

Much attention has been devoted to traumatic brain injuries, such as concussions, post-concussion syndrome and chronic traumatic encephalopathy (CTE), and their long term health consequence.⁶ However, there is a much more sinister and immediate head injury, an intracranial hematoma that can cause death within hours or days of the trauma that may go unnoticed until it is too late to remediate. Dubbed by the press as “Talk and Die Syndrome” a seemingly minor bump on the head can have life-altering consequence. The victim initially appears fine and lucid. In reality, an intracranial hemorrhage is at work and as the bleeding progresses; the person starts

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¹ Samuel D. Hodge, Jr. is a skilled litigator and professor at Temple University where he teaches both law and anatomy. He has authored more than 150 articles in medical and legal journals and has written six medical/legal texts. He also enjoys an AV preeminent rating and has been named a top lawyer in Pennsylvania on multiple occasions.

² Jack, E. Hubbard is a board-certified physician in both neurology and pain medicine. In addition to his medical training, he holds a doctorate in anatomy. Dr. Hubbard has published widely on a number of topics in both medical and legal publications.

³ Natasha Richardson was the daughter of Vanessa Redgrave and an actress who enjoyed broad success on both the stage and in movies. At the time of her death, she was married to Liam Neeson. Natasha Richardson Biography, IMDB.COM, http://www.imdb.com/name/nm0001670/bio (last visited September 24, 2016).


⁵ Id.

to complain of a headache, becomes confused and lapses into a coma. As the pressure inside the cranial cavity builds, the brain can suffer irreversible damage resulting in death.\(^7\)

This article will address the medical causes and significance of an intracranial hematoma as well as the court decisions that have resulted from this medical emergency. A second purpose of this publication is to educate the reader about this life-threatening problem to mitigate its consequences by seeking immediate medical care.\(^8\)

I. Medical Considerations

An intracranial hemorrhage refers to any bleeding in or around the brain\(^9\) and it presents a significant public health danger because of its high rate of mortality and disability. The past few years have witnessed increased admissions to the hospital because of intracranial hemorrhages but the death rate has not decreased.\(^10\) Intracranial hemorrhages can happen in any age population but a person’s risk increases with age.\(^11\)

1. Anatomy

An appreciation of the anatomy is important to understand the various types of intracranial hemorrhages and their legal consequences. As a reference point, the skull is also

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\(^8\) A simple awareness of the symptoms and consequences of what seems like a minor head injury can save a person’s life. For instance, the parents of Morgan McCracken viewed a story on CNN about the tragic death of Natasha Richardson and remembered that Morgan was recently hit in the head by a baseball near her left temple. This prompted her parents to check the physical status of their daughter who appeared fine following the incident. Morgan started to complain of a headache when questioned so she was taken to the emergency room where a CT scan discovered an epidural hematoma. She immediately underwent lifesaving surgery. The physician noted that if the parents had not rushed their daughter to the hospital when they did, the child would have died. Elizabeth Cohen, *Natasha’s Lesson Helps Save Ohio Girl*, CNN.COM (Mar. 26, 2009), http://www.cnn.com/2009/HEALTH/03/26/head.injury.emergency/index.html.


called the *cranium*. Everything with the cranium is termed *intracranial*; everything exterior to the skull is termed *extracranial*. The important intracranial structures are the *brain*, *meninges* (coverings of the brain) and *vasculature* (blood vessels).

### a. The Brain

The brain, which sits within the *cranial vault* of the skull (Figure 1), is divided into three major regions – the cerebrum, brain stem, and cerebellum. (Figure 2) The *cerebrum* is the largest and newest part of the brain from an evolutionary point of view.\(^\text{12}\) It controls all conscious activity such as thought, speech, vision, memory, and emotions. In turn, the cerebrum is composed of two halves, termed *cerebral hemispheres*, which are interconnected by a thick band of nerve fibers; the *corpus callosum*.\(^\text{13}\) Each hemisphere is further divided into four lobes – frontal, temporal, parietal, and occipital. (Figure 2) These individual lobes are responsible for different functions, such as the occipital lobe that controls vision. Within the cerebrum is a series of chambers or cavities called the *ventricular system* which is filled with *cerebrospinal fluid* (CSF).\(^\text{14}\) (Figure 3) Made as an ultrafiltrate of blood within the lateral ventricles, CSF flows throughout the interior portion of the brain like a river, exiting into the *subarachnoid space*\(^\text{15}\) to be reabsorbed back into the vascular system. (Figure 11)

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\(^{13}\) The corpus callosum consists of a collection of nerve tissue made up of over 200 million nerve fibers that transmit electrical signals from the cell bodies of the neurons. This transmission is important because it allows the two sides of the brain to talk to each other. Healthline Editorial Team, *Corpus Callosum*, HEALTHLINE.COM, http://www.healthline.com/human-body-maps/corpus-callosum (last visited Oct.12, 2016).


\(^{15}\) The subarachnoid space is the area between the arachnoid and pia, and it is filled with cerebrospinal fluid. Ronan O’Rahilly et al., *Basic Human Anatomy: A Regional Study of Human Structure, Ch. 41: The spinal cord and meninges* (2004), https://www.dartmouth.edu/~humananatomy/part_7/chapter_41.html.
The brain stem is attached at the base of the cerebrum and it is the connection between the brain and spinal cord. (Figure 2) This structure controls the cranial nerves that allow for movement and sensation to structures of the head such as eye movement, facial sensation, facial movement, and hearing. In addition, it is important because of the lethal consequences of an intracranial bleed in this area since the brain stem controls such critical functions as respiration (breathing), heart rate, blood pressure, and consciousness.

The cerebellum, also known as the “little brain,” rests behind the brain stem and is important in balance and coordination. (Figure 2) The cerebellum makes up only a small part of the brain but it holds about half of the brain's neurons that convey information through electrical signals.16

Parts of the brain rest within certain depressions within the interior of the skull; each depression is termed a fossa. The frontal lobes of the cerebral hemispheres fit into the anterior cranial fossa, the temporal lobes rest in the middle cranial fossa, and the cerebellum fits into the posterior cranial fossa. (Figure 4) The base of the skull contains a large opening, the foramen magnum, through which the spinal cord enters and joins up with the brain stem. (Figure 4) As will be discussed later, the foramen magnum is important for the lethal phenomenon called a brain herniation that may result from an intracranial bleed.

b. Meninges

The meninges, or coverings of the brain, make up the second important intracranial structure. Three different layers of meninges surround the brain and are instrumental in its protection; the pia mater, arachnoid layer, and dura mater. (Figure 5) The pia mater, or innermost covering, is a thin membrane directly attached to the brain’s surface. Layered on top

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of the pia mater is the second covering; a delicate web type membrane termed the arachnoid layer. Between the pia mater and arachnoid is a space, the subarachnoid space, which contains cerebrospinal fluid. Surrounding these two layers is the outermost thick membrane, the dura mater. “Epi” means above, so the space above the dura mater and between the inner lining of the skull is the epidural space. In turn, “sub” means below, so the space between the dura mater and the arachnoid layer is the subdural space. Similarly, the space below the subarachnoid layer is the subarachnoid space. The names of these spaces are important as they are the location of the various types of intracranial bleeding discussed below.

c. Vasculature

The third important intracranial structure is the vasculature, or blood vessels, consisting of arteries and veins. Arteries conduct blood flow, rich with oxygen, from the heart up to the head. Since these blood vessels run directly from the heart, they are under a high pressure generated by the contractile force of the heart. Two intracranial arterial systems are the carotid arteries which supply the front two-thirds of the brain, and the vertebral arteries which supply the back one-third of the brain. (Figure 6) These two arterial systems join at the base of the brain in a circular arterial pattern termed the circle of Willis, named after a British anatomist. (Figure 6) Both arterial systems supply both the surface of the brain, and also give off penetrating branches which run deep into the brain substance. Veins, on the other hand, are a low pressure system that drain the brain into a series of venous sinuses located within the dura mater. (Figure 7) This deoxygenated blood is then drained into the jugular veins and back down into the heart.

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17 The acronym for the three layers of the meninges is PAD (pia, arachnoid and dura) since they pad and protect the brain and spinal cord.
2. Phenomenon of Rising Intracranial Pressure

To understand why intracranial bleeds are so debilitating and deadly, one needs to appreciate the phenomenon of increased intracranial pressure. While the hard casing of the skull protects the brain, the structure can also be a death trap. In children up to age two, the bones of the skull have not fused, allowing for expansion of the head in response to increasing intracranial pressure such as with hydrocephalus.\(^\text{18}\) By age two, however, the fused cranial bones form a solid, hard bony casing that has no give. Consequently, any growing intracranial mass, such as a cancerous tumor or accumulating blood, increases the pressure within the skull, termed intracranial pressure, which is normally measured at 20 cm of water. This is a closed system, and since the skull cannot expand and the cerebrospinal fluid within the ventricular system and subarachnoid space cannot be compressed, the tissue of the brain must give way.

One of the earliest symptoms of increasing intracranial pressure is a headache, made worse while lying down, when coughing or straining. This headache is due to stretching and irritation of the pain sensitive dura mater. Paradoxically, brain tissue itself is pain insensitive since no pain receptors are located within the structure. As the intracranial mass enlarges, such as with a hematoma, local pressure disrupts the function of nearby brain tissue causing focal neurological impairments such as speech difficulty, vision loss, and extremity weakness, depending upon what part of the brain is affected. Continued damage due to the pressure of the accumulating blood may result in permanent neurological impairment and it can compress nearby arteries resulting in a stroke\(^\text{19}\) due to impaired blood flow through those vessels. Finally,

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18 Hydrocephalus results when too much cerebrospinal fluid accumulates in the brain. This condition can exist at birth or be subsequently acquired from such things as trauma, a brain hemorrhage or a stroke. This abnormal acclamation of fluid can damage the brain and be fatal if untreated. Hydrocephalus, MEDLINEPLUS.GOV, https://medlineplus.gov/hydrocephalus.html (last visited Oct. 13, 2016).

19 A stroke takes place when a clot ruptures or obstruct a blood vessel in the brain. This development prevents the brain from obtaining a much-needed supply of blood and oxygen, resulting in tissue death of the brain. What is
the pressure from the growing intracranial hematoma may become so great that it forces the brain downward through the foramen magnum, a phenomenon termed a *brain herniation*.

(Figure 8) A herniation compresses the brain stem with such force that the centers controlling consciousness, respiration, heart rate, and blood pressure stop functioning resulting in coma and death. One of the earliest signs of an impending herniation, a neurological emergency, is the impairment of the nerves controlling the pupils of the eyes, the oculomotor nerves (cranial nerve III). With a herniation, resulting damage to the oculomotor nerves cause the pupils to not respond and the eyes are described as “fixed and dilated.” That is, the pupils are dilated (open) and do not respond when light is shone into them (fixed).

The term “talk and die syndrome,” therefore, refers to that situation after head trauma when the person initially seems fine, even after a brief period of loss of consciousness. However, with an intracranial bleed, the increasing volume of accumulating blood causes additional intracranial pressure, and the person undergoes neurological deterioration with focal neurological signs, coma, and then death. If not diagnosed and treated in a timely fashion, the growing hematoma results in the fatal brain herniation. The well-known admonition after head trauma is not to let the person sleep but it is not sleep that will bring on the hemorrhage. Rather, it is simply that while asleep, the person cannot be monitored for progressive neurological changes resulting in irreversible brain damage and death.

3. **Types of Intracranial Hemorrhages**

Trauma can cause intracranial bleeding within the brain (*intra-axial* or *intraparenchymal*), or outside of the brain (*extra-axial*). Bleeding outside of the brain occurs in

one of the meningeal spaces – epidural, subdural or subarachnoid – each location having its own unique features. (Figure 9)

a. Intra-Axial Bleeds

_Intra-axial_ (also termed _intraparenchymal_) bleeds from trauma are due to ruptured blood vessels caused by the impact with bleeding directly into the substance of the brain. (Figure 9) In its mildest form, trauma can cause a _contusion_, or bruising that is seen superficially on the surface of the brain. A contusion is more serious than a concussion and occurs when the surface blood vessels are torn, resulting in small hemorrhages on the brain’s surface. This condition does not commonly result in a brain herniation, and the contusions usually occur under the frontal and temporal lobes where the brain rests in the anterior and middle cranial fossa or depressions in the floor of the cranial base, respectively. With the jostling of brain from trauma, the rough bony surfaces in those skull regions tear the brain surface causing bleeding.

If the trauma is more severe or the contused bleeding is prominent such as if the person is taking an anticoagulant medication, the gushing blood volume increases within the brain, compressing surrounding brain tissue thereby leading to neurological dysfunction, coma, and death by herniation. The bleeding can also extend deep into the brain to the ventricular system, resulting in an _intraventricular hemorrhage_, a worse prognostic situation. While trauma can cause intra-axial bleeds, other common causes include hypertension, bleeding from a brain tumor, or an abnormal blood vessel, such as an aneurysm or arteriovenous malformation (AVM).

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b. Extra-Axial Bleeds

An extra-axial bleed occurs outside of the brain, but within the skull and in relationship to one or more of the meningeal membranes. These types of hemorrhages are termed epidural, subdural, and subarachnoid bleeds. Each of these types of bleeds has its own unique features.

An epidural bleed, also termed an epidural hematoma, occurs within the epidural space; that is, the space between the dura mater and the skull. While an epidural hematoma can occur spontaneously, most bleeds of this kind result from trauma. In the vast majority of instances, some form of trauma causes a skull fracture injuring the blood vessels near the primary injury. (Figure 10) It is these blood vessels that create the epidural hematoma. Statistically, an epidural bleed is much less common than a subdural hematoma and occurs most often in young male adults. The most common location for an epidural bleed is the temporal region just above the ear where the skull is the thinnest and easily fractured by a direct blow. A fracture in this area can tear the underlying middle meningeal artery which runs over the surface of the dura mater in that region. With the tear, arterial blood from the torn artery quickly fills the epidural space, leading to catastrophic consequences such as what happened to Natasha Richardson. The typical presentation is that there may be no or a brief loss of consciousness with the person

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24 The temporoparietal region accounts for about 70-80% of all epidural hematomas. Price, supra note 22.

25 “The middle meningeal artery normally arises from the first or mandibular segment of the maxillary artery, just behind the condylar process of the mandible, and enters the skull through the foramen spinosum.” Middle Meningeal Artery, SCIENCE DIRECT, http://www.sciencedirect.com/topics/page/Middle_meningeal_artery (last visited Oct. 14, 2016).

26 As the epidural hematoma increase in volume, it can cause a midline shift in the brain. Price, supra note 22.
feeling well except for a headache. This *lucid interval* is followed by neurological deterioration as the blood volume increases at the site of the bleed. The person may then become confused, have a fixed and dilated pupil on the side of the bleed, lapse into coma followed by death through a brain herniation if not quickly diagnosed and treated – “talk and die.”

A *subdural hematoma*, (Figure 9) develops between the arachnoid layer and the dura mater, occurs more frequently than epidural bleeds and is the most common traumatic intracranial bleeds; the two types – epidural and subdural - can be present at the same time. Unlike an epidural hematoma that results from a high pressure arterial bleed, a subdural hematoma is usually due to a low pressure venous bleed. These types of hemorrhages most often occur with serious head trauma but they may have their origins after a negligible head injury, particularly in the older population. In these situations, *bridging veins* draining the brain surface into the venous sinuses tear from the sudden acceleration with a hit to the side of the head or a rapid deceleration such as with a fall. Blood then oozes from the torn veins rather than being pumped out as with an arterial bleed. Consequently, unlike an epidural hematoma which can manifest itself within hours, a subdural hematoma may take days to months to become evident. For this reason, subdural hematomas are generally divided into acute, subacute or chronic, depending upon the amount of bleeding and age of the patient.

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27 Most epidural hematomas are relatively stable and enlarge to their maximum volume within minutes of the trauma. Nevertheless, about 9% of epidural hematomas continue to increase in size during the first 24 hours. *Id.*
29 *Id.*
Acute subdural hematomas, like epidural bleeds, can develop rapidly with a similar clinical picture, especially in younger patients. Subacute subdurs may not become manifest until several days to a week have passed. Chronic subdurs can take weeks and sometimes months before they become apparent. These types of subdural hematomas are most commonly seen in elderly patients who have significant amount of brain atrophy. In these cases, blood slowly builds up because of the increased room to store it. With time, the subdural hemorrhage can liquefy and increase in size due to osmotic flow, resulting in a subdural hygroma. Often elderly patients with a chronic subdural hematoma are initially diagnosed as having dementia. It is important to perform a CT or MRI scan in someone thought to have Alzheimer’s disease to rule out a potentially treatable cause for the dementia. In elderly patients, especially those on anticoagulant medications, direct head trauma may not be necessary to cause the bleed. Often just the rapid deceleration from a fall without striking the head is sufficient to tear the bridging veins that are already stretched due to brain atrophy. A subdural hematoma is also seen in infants and children as the result of child abuse.

A subarachnoid hemorrhage occurs between the subarachnoid membrane and the pia mater or surface of the brain. (Figure 9) In this regard, it is important to remember that the subarachnoid space is the area “where the cerebrospinal fluid circulates, and it’s responsible for protecting [the] brain from serious injuries by serving as a cushion.”

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33 Subdural Hematoma, supra note 31.

common cause of a subarachnoid bleed, and a ruptured intracranial aneurysm\textsuperscript{35} is the most frequent non-traumatic cause of a subarachnoid hemorrhage. In these cases, blood caused by the trauma leaks into the cerebrospinal fluid-filled subarachnoid space. Unlike an intra-axial, epidural or subdural bleed, there is no large volume of blood compressing brain tissue resulting in a focal neurological impairment. Rather, blood is distributed diffusely throughout the subarachnoid space and even into the ventricles resulting in a severe headache, nausea and vomiting. However, blood in the subarachnoid space has its own complications. One of these adverse consequences is an intense \textit{vasospasm},\textsuperscript{36} of nearby arteries due to the irritation of the surrounding blood, usually occurring within 1-3 days. This vasospasm can be so marked that it restricts blood flow to that region of the brain, resulting in an \textit{ischemic stroke}.\textsuperscript{37} Another complication of a subarachnoid hemorrhage is the development of \textit{hydrocephalus}. As discussed previously, cerebrospinal fluid is formed within the lateral ventricles in the cerebral hemispheres and flows like a river throughout the brain to exit from openings in the brain stem into the subarachnoid space. (Figure 11) Blood within the ventricular system or subarachnoid space accumulating at these exit points can plug them up and stop the CSF flow. Nevertheless, cerebrospinal fluid continues to be produced at a rate of 500 cc (about half a quart) a day so with this blockage, it does not take long before the ventricular system enlarges due to the increased

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\begin{footnotes}{37} An ischemic stroke is the result of an obstruction within a blood vessel supplying blood to the brain. \textit{Ischemic Strokes (Clots)}, \textit{AMERICAN HEART ASSOCIATION}, http://www.strokeassociation.org/STROKEORG/AboutStroke/TypesofStroke/IschemicClots/Ischemic-Strokes-Clots_UCM_310939_Article.jsp#WL6ml70k11w (last visited Mar. 7, 2017).
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volume of spinal fluid, much like a dam backing up a river. The increase in ventricular size is termed hydrocephalus, which, if unchecked, can lead to coma and death.

4. **Diagnosis of an Intracranial Hemorrhage**

Despite the potentially catastrophic nature of traumatic intracranial bleeds, most emergency room patients who have sustained mild head trauma may have a concussion but nothing more serious, and further evaluation such as imaging is not necessary. The discovery of an intracranial hematoma also does not automatically signal the need for surgery especially if it is small or produces no symptoms. However, because symptoms may spontaneously develop or deteriorate days or weeks subsequent to the trauma, the patient may have to be closely monitored for neurological changes.

The question then becomes what worrisome signs suggest a potential intracranial bleed? Certain “red flags” for this possibility include the following and should be immediately evaluated:

- Loss of consciousness at the time of impact;
- Nausea and vomiting;
- Severe headache;
- Focal neurological deficits;
- Confusion, lethargy;
- Any change in neurological status;
- Seizure; and

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39 Id.
• A patient taking an antiplatelet or anticoagulant medication such as Coumadin or have a coagulopathy resulting in poor clotting ability.

If there is any concern regarding a possible intracranial bleed, an immediate CT (computerized tomography) scan is mandated. The CT scan is preferred over an MRI (magnetic resonance imaging) for it is more quickly done and is more sensitive for picking up an acute bleed due to the iron bound in red blood cell hemoglobin. (Figure 12) Even if the initial scan is normal, if the patient does not improve and/or worsens, a repeat scan should be performed since bleeding can develop or expand within 1-2 days after injury. A lumbar puncture may also be necessary under the appropriate circumstance to further evaluate a subarachnoid hemorrhage or to exclude other brain issues unrelated to trauma such as meningitis.  

5. Treatment of a Traumatic Intracranial Hemorrhage

So many variables are possible in patients suffering from an intracranial bleed; a simple statement regarding management is not possible. However, there are certain principles that apply to these cases:

• Anyone taking anticoagulant medication must have the effects reversed to reduce further bleeding. Anticoagulants do not cause a bleed to occur, but they do make it more difficult to reduce the amount of bleeding present.

• If there is significant mass effect from the bleed, everything must be done to reduce the intracranial pressure. Such measures may include surgical evacuation of the hematoma, osmotic agents such as mannitol to reduce the associated brain swelling, and hyperventilation on a ventilator.

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• Some cases of intracranial bleeds can be managed with “watchful waiting” such as a small bleed or contusion without mass effect, small subdural hematoma especially in an elderly patient, and a small amount of a subarachnoid blood.

• The outcome is related to the amount of bleeding found at the time of diagnosis.

II. Legal Consequences

1. Introduction

An intracranial hematoma can have dire consequences if not remedied in sufficient time.\(^4^1\) While trauma is the most frequent source of a brain bleed in those under 50,\(^4^2\) no one is immune from this medical emergency. Falls, motor vehicle accidents, sport’s injuries, military conflicts and physical assaults are just a few known causes.\(^4^3\) An intracranial hematoma can also be spontaneous, and non-traumatic, such as being caused by high blood pressure, an aneurysm, medication, structural weakness in the wall of a blood vessel, an arteriovenous malformation, a tumor and substance abuse.\(^4^4\) Needless to say, thousands of lawsuits have been filed as the result of these problems. A partial listing of cases involves blood vessels that rupture as the result of trauma, overexertion, occlusive and hemorrhagic strokes, aneurysms, fistulas and malformations, work related ruptures, failure to diagnose or property treat the malady, grafts and pseudo aneurysms, This law related discussion, however, will focus on the traumatic causes of an intracranial hematoma.

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The earliest reported case involving a traumatically induced brain bleed is almost 100 years old and involves a worker’s compensation claim. In *St. Clair v. A.H. Meyer Music House*, an employee was delivering a piano to the second floor of a residence when he felt an unusual sensation in his head that caused left sided paralysis. The plaintiff had ruptured an artery in his brain as the result of high blood pressure caused by lifting the heavy piano. The worker’s compensation claim was contested on the basis that there was no showing of an accidental injury occurring during the course of employment. This argument was rejected and worker compensation benefits were awarded.

2. Definitions

Several cases and legal publications provide definitions and background information on intracranial bleeds. The *Medical Disability Advisor* defines an intracranial hemorrhage “as a bleeding within the skull cavity that usually progresses rapidly and often results in permanent brain damage and death. All bleeding within the skull is called intracranial bleeding, whether the hemorrhage occurs within the brain itself (intracerebral hemorrhage) or in the area between the brain and the skull (epidural, subdural, and subarachnoid hemorrhage).” These types of brain hemorrhages will be discussed in more detail in the sections below.

The causes of intracranial hemorrhages were explained in *Hubbard v. Dan Valley Mills* as “injuries, to hemorrhage into tumors, to ruptures and aneurysms of the cerebral vessels, to ruptures of the vessels, due to high blood pressure, and arteriosclerosis, hemorrhage into

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45 178 N.W. 705 (Mich. 1920).
46 Id. at 705-06.
47 Id. at 706.
48 Id.
50 28 S.E.2d 723 (Va. 1944).
syphilitic lesions of the brain, fulminating meningitis and encephalitis.” State v. Bodi defines a subdural hematoma as “a circumscribed subdural effusion of the blood occurring in layers,” or a “collection of blood between the dura and the brain, or within the layers of the dura itself, without regard to any particular time element.” Stanley v. Ohio State University Medical Center distinguishes a subdural from a subarachnoid bleed. The court noted that each deals with a different source of bleeding and treatment options. With a subdural hematoma, “blood spills into the subdural space and is contained outside of the lining that covers the brain.” This blood is generally localized and exerts pressure on the brain which in turn results in ischemia and can cause an infarction or permanent injury. On the other hand, a subarachnoid hemorrhage causes blood to spill “within the brain covering and results in blood being mixed with cerebrospinal fluid. Thus, blood in the subarachnoid space will flow over the surface of the brain and actually come into contact with brain tissue.” While a subdural and subarachnoid hemorrhage can cause comparable discomfort and neurological compromise, a subarachnoid bleed usually does not require immediate surgery as is required with a subdural hemorrhage.

3. **Children and Intracranial Hematoma**

Children with intracranial bleeding present special problems and treatment options will differ based upon the size, cause, and location of the hemorrhage. Some minors are fortunate and have no adverse sequelae while others experience ongoing neurologic complications such as

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51 Id. at 724.
52 354 P.2d 831, 835-86 (Or. 1960).
53 No. 12AP-999, 2013 WL 6157232 (Ohio Ct. App.).
54 Id. at ¶25.
55 Id.
56 Id. at ¶26.
57 Id.
seizures, learning difficulties, speech issues, and abnormal movements. Minors are statistically less likely to develop an intracerebral hemorrhage as compared to adults. Nevertheless, the court has been confronted with a number of cases involving children and brain bleeds. Most involve some form of child abuse and the resultant complications including criminal charges or involuntary termination of parental rights.

*In Re Interest of Sebastian D.* involves the termination of parental rights as the result of the improper care of a child. The case focuses on subdural hematomas and retinal hemorrhages sustained by a boy which were labeled “non-accidental.” The facts show that during a wellness checkup, the physician found the circumference of Sebastian’s head had dramatically increased in size. An MRI revealed subdural hematomas of different ages. Testing ruled out other non-accident causes for these bleeds such as an infection, bleeding disorder or an arteriovenous malformation. The defense presented a pediatric neurologist who stated the condition could have been caused by a “benign axial fluid of infancy” which can result in a subdural hematoma from a minor impact. The expert also pointed out the lack of evidence of physical abuse such as bruising or fractures. Nevertheless, the court was swayed by the testimony of the state’s experts and ruled that the brain bleeds were caused by abusive head trauma rather than a benign condition.

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60 2016 WL 1697756 (Neb. Ct. App.).
61 *Id.*
62 *Id.*
63 *Id.* at 784.
State v. Bohannon involves a criminal conviction for child abuse for “inflicting serious bodily injury.” The government alleged that the child, a three months old baby, sustained injuries about his face, chest, shoulder and head, which caused the infant’s death. The facts demonstrated that an MRI showed a subarachnoid hemorrhage consistent with bruising on both sides of the brain. The court described a subarachnoid hemorrhage as a “bleeding under the arachnoid, or innermost layer of the brain.” A pediatric radiologist opined that “bleeding around the brain is a sign of significant trauma and can result in acute illness or death depending on the volume of the bleeding and increase in intracranial pressure.” The defendant was unable to explain how the infant sustained his injuries and claimed that the child fell off the couch and hit his face on the floor. In order to make out a case of child abuse in North Carolina, the state must show the defendant “intentional and without justification or excuse inflicted serious bodily injury.” The court found the defendant guilty and ruled that a subarachnoid hemorrhage is evidence of such an injury.

Shaken Baby Syndrome is a dangerous brain injury that results from a child being forcibly shaken as the result of the caregiver’s anger or frustration. It is a form of child abuse in which the trauma destroys the brain cells thereby preventing the cranium from receiving a sufficient supply of oxygen. This syndrome can cause both a subdural hematoma and a subarachnoid hemorrhage. Hemorrhages involving multiple layers of the retina are frequent

64 786 S.E.2d 781 (N.C. Ct. App. 2016).
65 Id. at 784.
66 Id. at 784.
67 Id. at 784.
68 Id. at 786.
69 Id. at 787.
complication.\textsuperscript{71} This form of abuse is most commonly seen in youngsters less than two years old and the perpetrator is usually the father, boyfriend, babysitter, or mother.\textsuperscript{72}

\textit{Castaneda v. State} offers an example.\textsuperscript{73} A couple lived with their two children and C.C., a son from the wife's previous relationship. One afternoon, the husband called his spouse at work and noted that C.C. was not breathing. When a first responder arrived at the home, C.C. was unconscious and did not have a pulse. The child was given CPR and rushed to the hospital. A CT scan revealed swelling in the child's brain so he was transported to a more advanced treatment facility. At this time, the father stated that “he grabbed C.C., that he tried breathing in his mouth, that he stuck his finger down his throat and that he shook him a little to tell him to breathe and that he wouldn’t breathe.”\textsuperscript{74} A second CT scan showed both a subdural and subarachnoid hemorrhage which were labeled “non-accidental trauma” and classic indicators of child abuse.\textsuperscript{75} Eventually, the caregiver admitted that he might have shaken the child harder than he originally claimed.\textsuperscript{76} The child died and a pathologist ruled the death a homicide after he found multiple brain hemorrhages during autopsy.\textsuperscript{77} At trial, the treating physician testified that C.C. died as the result of closed head and neck injuries which included a component of shaking.\textsuperscript{78} The defense produced an expert who opined the child’s death was natural and the result of hydrocephalus,\textsuperscript{79} which had been overlooked during the child’s treatment and autopsy.\textsuperscript{80} The defendant was found

\textsuperscript{71} \textit{Shaken Baby Syndrome}, AM. ASS’N OF NEUROLOGICAL SURGEONS (Nov. 2005), http://www.aans.org/patient\%20information/conditions\%20and\%20treatments/shaken\%20baby\%20syndrome.

\textsuperscript{72} \textit{Id}.


\textsuperscript{74} \textit{Id} at 2 ¶ 5.

\textsuperscript{75} \textit{Id} at 2 ¶ 6.

\textsuperscript{76} \textit{Id} at 7 ¶ 2.

\textsuperscript{77} \textit{Id} at 3 ¶ 3.

\textsuperscript{78} \textit{Id} at 4 ¶ 2.

\textsuperscript{79} \textit{Id} at ¶ 4.

\textsuperscript{80} \textit{Id}. paragraph 4.
guilty and the court noted that C.C. suffered a traumatic brain injury, which was evidenced by the various hematomas.81

4. Epidural Hematomas

An epidural hematoma has a good prognosis if treated promptly,82 and about 10% to 20% of all head trauma patients suffer this abnormality.83 An epidural hematoma is not related to a whiplash type injury but is associated with a structural disruption of the dural and skull vessels. An injury to the middle meningeal artery and dural sinuses is also frequently linked to this problem.84 Common causes of epidural hematomas include motor vehicle accidents, falls, direct trauma to the head, an assault, a workplace accident, mistakes during brain surgery and the improper administration of anti-coagulant medication.85

A search reveals over a thousand reported cases dealing with epidural hematomas86 and verdicts range from nothing to many millions of dollars. The following is a sample of a few recent cases. In Quinn v. Bowery Management Corp., the plaintiff was a patron at a nightclub87 when he engaged in an argument with a bar employee. The patron was escorted to his car where he was struck in the head with a flashlight by the defendant’s employee causing an epidural hematoma. The plaintiff was in a coma for two weeks and needed surgical intervention. As a

81 Id. at page 10 paragraph 5. For other cases involving children and intracranial hemorrhages, see People v. Gonzalez, 2016 IL App (3d) 130944-U; State v. Bodi, 223 Or. 486 (1960); State v. Ruiz, 329 P.3d 836 (Utah Ct. App. 2014); People v. McNabb, 2016 IL App (2d) 140270-U; Seals v. State, 222 P.2d 1037 (Okla. Crim. App. 1950).
83 Id.
84 Id.
86 This Westlaw search was conducted by the authors on September 30, 2016.
result of his brain injury, he alleged a future inability to work. A verdict of $15,400,000 was rendered in favor of the plaintiff.

Another multimillion-dollar verdict was issued in *Evert v. Yen* as the result of the failure to promptly remove an epidural hematoma.\textsuperscript{88} Evert had participated in a bike race and was asleep on the rear deck of his car when his vehicle was stuck by another automobile. First responders found the plaintiff disoriented and vomiting. He was transported to the hospital and a physician believed the symptoms were consistent with an epidural bleed. The defendant doctor was called and the patient was transferred to another facility to be treated by this neurosurgeon. As the patient was being wheeled to the ambulance for transport, the E. R. doctor observed a depression in the skull and ascertained Evert needed intervention within 10 minutes.\textsuperscript{89} The physician at the new hospital issued an order for a battery of test for the plaintiff upon arrival. Evert was not greeted by the defendant at the hospital and his condition continued to deteriorate. About 45 minutes later, the nurse called the defendant at home and reported the patient’s condition.\textsuperscript{90} This physician asked for the operating room to be prepared but he did not show up at the hospital until one hour after Evert’s arrival. At this point, the plaintiff was unresponsive so a craniotomy was performed and a large epidural hematoma was removed.\textsuperscript{91} Suit was filed and the plaintiff’s expert testified that the defendant deviated from the standard of care by failing to immediately go to the medical care facility to initiate neurosurgical care. Furthermore, he maintained that the wrong procedure was utilized to remove the epidural bleed. The thick clotted blood required the use of enlarged holes in order to suction it out. The defendant claimed that the information he received was not sufficient to prompt him to immediately go to the hospital. He

\textsuperscript{89} Id.
\textsuperscript{90} Id.
\textsuperscript{91} Id.
also stated that the appropriate level of care allowed him to stay at home until he received the nurse’s initial assessment.\textsuperscript{92} The jury did not buy these explanations and returned with a $5,000,000 verdict which was reduced to $3,604, 891 after applying offsets and credits.\textsuperscript{93}

Not all claims are so successful and a number have resulted in defense verdicts. In \textit{Newton v. Neurosurgical Associates, Ltd.}, a wrongful death action was filed as the result of an epidural hematoma that was discovered while under the care of the defendant.\textsuperscript{94} The plaintiffs maintained that the physician failed to properly diagnosis the decedent’s condition and timely evacuate the epidural hematoma.\textsuperscript{95} The defense claimed that the proper standard of care required the physician to allow the epidural hematoma to reduce in size before attempting surgery. A defense verdict was rendered.\textsuperscript{96}

In \textit{Sargent v. Corporal Kulick}, the plaintiff alleged that her civil rights were violated because of the actions of a police officer which caused an epidural hematoma and multiple fractures.\textsuperscript{97} The incident arose after Sargent left a casino and could not locate her car keys. An officer arrived and told the plaintiff that she was not fit to drive. An altercation ensued and the plaintiff was injured when she was pinned against her car while being arrested. During the scuffle, she fell to the ground and hit her face on the paved surface.\textsuperscript{98} The evidence subsequently

\textsuperscript{92} \textit{Id.}
\textsuperscript{93} \textit{Id.} Another multi-million dollar verdict includes \textit{Zganjer v. Jacobson New York United Hospital, 23 N.Y. J.V.R.A. 4:C2 (N.Y. Sup. Ct. 2006)} (This case also arose out a motor vehicle accident in which the plaintiff sustained an epidural hematoma. She ended up being rushed into surgery and was left with permanent brain damage and the inability to speak. Suit was filed against the emergency room physician claiming that he should have detected the brain bleed earlier. The defense argued that the diagnostic studies failed to provide clear evidence of the epidural hemorrhage. The case settled before trial for $7,850,000.).
\textsuperscript{94} JVR No. 459762 (Ariz. 2005).
\textsuperscript{95} \textit{Id.}
\textsuperscript{96} \textit{Id.}
\textsuperscript{97} JVR No. 1602190049 (M.D. Pa. 2011).
\textsuperscript{98} \textit{Id.}
showed the plaintiff’s blood/alcohol was three times the normal limit. A verdict was returned in favor of the defendant.99

Not all cases are so extreme. One such example is *Lozada v. Perry*.100 This matter involves a conflict between two neighbors. During an argument, the defendant suddenly punched the plaintiff causing him to hit his head on the ground. The plaintiff fractured his skull and nasal bone and sustained an epidural hematoma.101 This left him with temporary balance problems, sleeping difficulties, a hearing loss and personality changes. The defendant claimed that he acted in self-defense but the court did not believe this testimony. A $140,000 verdict was rendered in favor of the plaintiff.102

An award of $25,000 for an epidural hematoma requiring brain surgery was found insufficient in *Dulmar v. Lange*.103 The plaintiff, an eight-year-old child, was hit by a car being driven by the defendant. The plaintiff sustained, among other things, a broken collar bone and fractured skull which mandated immediate brain surgery to evacuate an epidural hematoma. The jury determined that the plaintiff was more responsible for the accident than the driver of the car and awarded $25,000 for past pain and suffering and nothing for future pain and suffering, even though the child continued to manifest neurological problems.104 On appeal, the court set aside the verdict and ordered a new trial on damages.105

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101 *Id.*
102 *Id.*
104 *Id.* at 450.
105 *Id.*
5. **Subdural Hematomas**

An acute subdural hematoma (SDH) is one of the most lethal forms of head trauma. Blood can engulf the brain very quickly, thereby squeezing cranial tissue. These types of bleeds can be the result of very minor trauma to the head, and go undetected for days or weeks. When reviewing the records of a client with a subdural hematoma, counsel should be aware that certain factors increase the risk of developing this complication including blood thinners, being very young or old, long term alcohol abuse, repeated falls, past head injuries and conditions that cause the blood to clot poorly.

There are more than 3,500 reported cases involving subdural hematomas, and numerous awards and settlements have been issued for over a million dollars. *Di Marco v. New York City Health and Hospitals Corp.* provides an example. This medical malpractice case involved a firefighter who sustained a subdural hematoma in a charity boxing match. This injury left him in a coma for eight months. The case was premised on the delays in medical treatment. For instance, the plaintiff had to wait 25 minutes upon arrival at the emergency room before being seen. The doctor correctly diagnosed the problem as a subdural hematoma, but the patient had to wait an additional 45 minutes before a request was made to transfer him to a critical care facility. Shockingly, an ambulance did not transport the plaintiff for another 45 minutes. When the man finally arrived at the new hospital, the subdural hematoma was evacuated, but the

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107 Id.
109 This figure is based upon a Westlaw search conducted by the authors on October 1, 2016.
111 Id.
112 Id.
plaintiff was left with irreparable brain damage. The initial emergency room facility was sued for malpractice on the basis that they failed to promptly diagnosis and treat the patient’s condition.\textsuperscript{113} The plaintiff was successful in his claim and awarded $9,570,400.\textsuperscript{114}

In a criminal context, there are multiple cases involving child abuse and subdural hematomas.\textsuperscript{115} This is not surprising since a subdural hematoma is a common brain injury in abuse cases.\textsuperscript{116} Likewise, a subdural hematoma is a common brain injury in assaults. \textit{People v. Singleton} is illustrative.\textsuperscript{117} The defendant stole the victim’s purse and inflicted a subdural hematoma in the process. Eight days later, the victim died and there was no other intervening event that could have produced the brain bleed. The defendant was convicted of murder and robbery and the charges were upheld on appeal.\textsuperscript{118}

Another homicide conviction was sustained in \textit{State v. Hill} as the result of a subdural hematoma.\textsuperscript{119} Several individuals were drinking and a fight broke out between two of the people. The defendant, who outweighed the victim by 50 pounds, punched and kicked the victim in the face. First responders found the victim semiconscious and having difficulty breathing.\textsuperscript{120} An examination at the hospital revealed the patient had lapsed into a deep coma, was unresponsive and had a blood/alcohol of .42%.\textsuperscript{121} Brain surgery was performed to remove a subdural hematoma that encompassed most of the left hemisphere.\textsuperscript{122} Unfortunately, the patient

\begin{footnotesize}
\textsuperscript{113} \textit{Id.} \\
\textsuperscript{114} \textit{Id.} \\
\textsuperscript{116} Subdural Hematoma, Gale Encyclopedia of Children’s Health,” Infancy Through Adolescences, Thomas Gale, Encyclopedia.com., 2006. \\
\textsuperscript{118} \textit{Id.} at 79. \\
\textsuperscript{120} \textit{Id.} at 747. \\
\textsuperscript{121} \textit{Id.} at 747. \\
\textsuperscript{122} \textit{Id.} at 748.
\end{footnotesize}
died eight days later.\textsuperscript{123} In response to the murder charges, the defendant maintained that there was insufficient evidence to show that he caused the death and pointed to a prior beating involving the victim.\textsuperscript{124} The combatant also noted that the facial lacerations he inflicted were minor and there was no visible sign of external injury at the location of the hematoma.\textsuperscript{125} The government produced the attending physician who unequivocally noted that the victim’s demise was the result of a coma and subdural hematoma. The defendant was found guilty of manslaughter and the conviction was upheld on appeal.\textsuperscript{126}

\textit{Collins v. Mosaic Fertilizer, LLC} is an example of a worker’s compensation claim involving a subdural hematoma.\textsuperscript{127} This matter deals with an appeal of the trial judge’s decision rejecting the opinion of an expert medical advisor he appointed who casually relating an emergency operation for a subdural hematoma a year after a compensable fall to the worker’s employment.\textsuperscript{128} The judge discarded the opinion of the medical advisor since diagnostic imaging four months after the injury failed to reveal the bleed, all of the expert’s agreed that such evidence should have been present on the films and no articles supported a delay in the development of the hematoma for one year.\textsuperscript{129} This adverse determination was reversed on appeal. The expert medical advisor linked the bleed to the compensable injury and the judge failed to set forth any “clear and convincing evidence to the contrary.”\textsuperscript{130}

Social Security Disability benefits are available to those who are unable to work as the result of a medical problem that will continue for at least one year and federal law applies a very

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{123} \textit{Id.} at 748.
\item \textsuperscript{124} \textit{Id.} at 749.
\item \textsuperscript{125} \textit{Id.}
\item \textsuperscript{126} \textit{Id.} at 752.
\item \textsuperscript{127} \textit{Collins v. Mosaic Fertilizer, LLC}, 121 So. 3d 1119 (Fla. Dist. Ct. App. 2013).
\item \textsuperscript{128} \textit{Id.} at 1120.
\item \textsuperscript{129} \textit{Id.}
\item \textsuperscript{130} \textit{Id.}
\end{itemize}
\end{footnotesize}
rigid definition of “disability.”

Patterson v. Secretary Of Health And Human Services involves the denial of Social Security benefits despite the claimant’s subdural hematoma. The facts show that Patterson sustained a brain bleed and seizure disorder as the result of an altercation with the police when he was hit in the head with a nightstick. The claimant was thirty-three years old, only had a high school education and had worked in construction. The Administration Law Judge (ALJ) acknowledged that Patterson was left with motor seizures and other residuals from the subdural hematoma as well as problems with his shoulder. Nevertheless, the ALJ found that Patterson was still able to work in a job with a limited range of sedentary work, and many such positions were available. This decision was upheld on appeal.

6. Subarachnoid Hematomas

The subarachnoid space is part of the meninges through which cerebrospinal fluid flows. In turn, a subarachnoid hematoma (SAH) denotes a bleeding within this space.

A number of the case on subarachnoid hematomas include subdural hematomas and have their origins in a child abuse scenario. A personal injury claim, however, is presented in Green v. Kaplan, which involves a pedestrian who was struck by a car in an unmarked crosswalk.

132 884 F.2d 580 (6th Cir. 1989).
133 Id.
134 Id. See also Lee v. Astrue, 6:11-1518-TMC, 2012 WL 5386539, at *3 (D.S.C.).
and the incident occurred on a rainy night.\(^{139}\) The pedestrian sustained a closed head injury and subarachnoid hemorrhage, and the matter settled for $750,000 before the start of trial.\(^{140}\)

*Tenove v. Jahroumi* has its origins in a motor vehicle accident.\(^{141}\) The defendant was returning home after Botox injections in her face area. Because the sun was bothering her eyes, she reached for sunglasses.\(^{142}\) The defendant then went through a red light, failed to brake and struck the plaintiff’s car.\(^{143}\) The plaintiff sustained a left frontal subarachnoid hemorrhage.\(^{144}\) Additional studies three months later still showed blood in the left frontal lobe of her brain.\(^{145}\) The tortfeasor admitted the plaintiff sustained a traumatic brain injury but asserted that her cognitive difficulties were related to pre-existing issues and over medication.\(^{146}\) Mediation resulted in a settlement for $3,750,000.\(^{147}\)

g. **Rupture of Blood Vessels from Trauma**

A cerebral or intracranial aneurysm refers to a ballooning of a blood vessel in the brain that fills with blood when it ruptures.\(^{148}\) There are many causes of this ballooning but trauma can play a role in their development.\(^{149}\) The life threatening consequences are not related to the weakness in the wall of the blood vessel itself but the risk of rupture which can cause a hemorrhage in the brain.\(^{150}\)

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\(^{139}\) *Id.*  
\(^{140}\) *Id.*  
\(^{141}\) *Tenove v. Jahroumi*, 2016 WL 3345740 (Cal. Sup. Ct.).  
\(^{142}\) *Id.*  
\(^{143}\) *Id.*  
\(^{144}\) *Id.*  
\(^{145}\) *Id.*  
\(^{146}\) *Id.*  
\(^{147}\) *Id.*  
\(^{150}\) *Cerebral Aneurysms Information Page*, National Institute of Neurological Disorders and Stroke, *supra* ?.
When the artery or vein is injured by some external force, such as a car accident or blow to the head, an issue may appear as to whether the abnormality existed before the event or whether the trauma produced or impacted the intracranial bleed. The complicating factor is that the symptoms are identical regardless of their cause. Those related to trauma may have a myriad of causes including a blunt or penetrating injury and knife wounds have the greatest chance of creating a traumatic aneurysm. They can also be related to surgical procedures such as subdural taps, intracranial operations and endoscopic ventriculostomies.

There are over 7,000 reported decisions involving ruptured blood vessels rendered by administrative agencies such as the Veterans Administration, worker’s compensation boards and employee compensation boards. Reported court decisions are much more limited and number around 200. Snyder v. San Francisco Feed and Grain provides a definition of an aneurysm as “a weak spot in a blood vessel analogous to a weak spot in an inner tube which expands and develops a balloon-like appearance.” This case involves a worker’s compensation claim in which an employee sustained a ruptured aneurysm during the course of her employment as the result of job stress. Her manager had a confrontational work style that affected the morale of employees. On the day in question, a difficult client was scheduled to visit the facility and the claimant was unable to read invoices prepared by the manager. These events upset her, and she was discovered slumped over a desk with a ruptured aneurysm. The facts reveal that the

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151 Robert Hair & David Polin, Rupture of Blood Vessels Due to Trauma, 31 AM. JUR. PROOF OF FACTS 2D 265 (1982).
152 Id.
153 Id.
155 These statistics are based upon a Westlaw search conducted by the authors on October 3, 2016.
156 748 P.2d 924 (Mont. 1987).
157 Id.
158 Id.
employee had an aneurysm since she was a teenager but it was asymptomatic. However, psychological stress can increase a person’s blood pressure causing increased tension on the aneurysm often triggering a rupture.  

At trial, the experts concurred that an average individual would have found the employee’s work environment remarkably taxing. In granting benefits, the court noted that a physical injury is not necessary for a compensable injury. Rather, some conduct or chain of events must be demonstrated that may be linked to the ensuing injury. The court further noted, “that the unusual and unexpected mental strain of a stressful work environment which causes a pre-existing aneurysm to rupture is a tangible happening of a traumatic nature from an unusual strain.” This case is not unique. Many courts have found stress can rupture a blood vessel making it a compensable event. 

The more traditional scenario involves a traumatic event as the cause of an aneurysm. For instance, in Jackson v. T.K. Stanley, the claimant fell and was hit in the head by a post digger. He was diagnosed with a contusion and released back to work. Several months later, he was hospitalized with headaches and shortness of breath. A CT scan revealed a hemorrhage in the left temporal and parietal lobes with a subarachnoid hemorrhage. This required immediate brain surgery. The employee filed a worker’s compensation claim, but the defendant maintained that there was no evidence casually connecting the aneurysm to the work related incident. Rather, the aneurysm was related to the employee’s high blood pressure. A court-appointed physician

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159 Id.
160 Id.
161 Id. at 930.
164 Id.
opined that the claimant had a pre-existing aneurysm but related the rupture to the accident.\textsuperscript{165} Three experts agreed that “trauma induced fusiform aneurysms can be slow to develop” and “that time may elapse between a trauma occurring and the actual worsening of the condition to the status of an aneurysm which ruptures.”\textsuperscript{166} The Court found in favor of the worker and noted the surgery was a result of both the work accident and the claimant’s pre-existing hypertension. Therefore, the aneurysm rupture was compensable.\textsuperscript{167}

One of the more unusual cases involving a ruptured aneurysm occurred during childbirth. \textit{Larkin v. Johnston} concerned a young woman who visited her family doctor because of dizziness.\textsuperscript{168} Diagnostic studies were positive for a venous varix on the left side of the brain, and the right side contained an aneurysm. The physician did not include these abnormalities on the patient’s list of problems as required by the group practice.\textsuperscript{169} A couple of years later, she became pregnant and saw an obstetrician in the same group practice. The woman had a vaginal birth and it was alleged that the stress from the Valsalva maneuver\textsuperscript{170} during childbirth caused increased pressure in the brain and a clot developed. This resulted in a hemorrhagic stroke, mandating a craniotomy and lobectomy.\textsuperscript{171} The plaintiff lost the use of her extremities except for one and could no longer take care of herself. Suit was instituted, and the plaintiff asserted that her family doctor’s failure to reveal the brain abnormalities to her obstetrician was negligent.

\begin{footnotes}
\textsuperscript{165} \textit{Id.} \\
\textsuperscript{166} \textit{Id.} \\
\textsuperscript{167} \textit{Id.} \\
\textsuperscript{169} \textit{Id.} \\
\textsuperscript{170} The Valsalva maneuver is the process during childbirth where a woman is instructed to “Take a deep breath, hold your breath, and push…” \textit{Bearing Down or Pushing While Giving Birth}, BELLYBELLY.COM (last updated Feb. 21, 2015), http://www.bellybelly.com.au/birth/bearing-down-or-pushing/. \\
\textsuperscript{171} \textit{Id.}
\end{footnotes}
violated the defendant's policies and procedures, and caused the stroke. Following a trial that lasted more than one week, the jury returned with a $35,400,000 verdict.

7. **Skull Fractures and Intracranial Hematomas**

A skull fracture is dangerous because of the obvious damage it can inflict on the brain tissue but it can also injure the blood vessel surrounding the brain. A fracture at the base of the skull can cause blood to accumulate behind the eardrum, or blood may flow from the ear if the eardrum is ruptured. A skull fracture may also cause bleeding from the wound itself, nose, or area around the eyes and a hemorrhage can develop under the skull or compress the layers of the meninges; the dura, arachnoid and pia.

A small number of reported cases discuss skull fractures and intracranial hematomas. Many of them focus on child abuse and related criminal charges. The most unusual case, however, is *Estate of Bland v. Islamic Republic of Iran* and its $955,652,324 award. This lawsuit has its origins with the bombing of the Marine barracks in Beirut in 1983. Many people were killed or injured in the terrorist attack. A special master set a value for the claims based upon the injuries and special circumstances with two exceptions. One of the cases involved John Gibson who suffered among other injuries, “a left frontal fracture of his skull; an intracranial hematoma; a perforated eardrum; and a retinal occlusion as a result of the

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172 *Id.*
173 *Id.*
175 *Id.*
177 *Id.*
178 A Westlaw search conducted by the authors on October 4, 2016 disclosed less than 100 cases.
181 *Id.*
explosion.”182 This serviceman underwent multiple operations; part of his skull was replaced with plastic and the operations left him cross-eyed. His award was increased from the base of $5,000,000 to $8,000,000.183

*Avalos–Landeros v. United States* involved a baby who was born at Mount Sinai Hospital Medical Center and placed in the Neonatal Intensive Care Unit (NICU).184 The parents allege that the baby sustained a fractured skull and multiple hematomas of the left frontal lobe. A radiologist who reviewed films of the child’s head wrote, “There is a constellation of findings highly suggestive of substantial external impact to the left occiput with direct injury to the left occipital and temporal lobes associated with an intra-axial countercoup phenomena of the left frontal lobe and left middle cranial fossa subdural hemorrhage.”185 Three experts hired by the plaintiff stated that the infant’s injuries occurred during his stay in the NICU. The hospital moved for summary judgment asserting the parents cannot succeed on their *res ipso* *loquitur* claims because “Kaleb's injuries were caused, and could have been caused, by things other than the defendant’s alleged negligence.”186 This defendant noted that the plaintiff’s own experts talked about other causes for the injuries including hypoglycemia, hypoxic ischemic encephalopathy, and thrombocytopenia.187 The plaintiffs rebuttal was simple: “it is common knowledge” that babies staying in the NCIU do not “ordinarily sustain skull fracture [sic] and brain bleeding in the NICU absent negligence.”188 The court sided with the plaintiff and noted that this question is one for the jury.

182 *Id.*
183 *Id.*
184 *Id.*
185 50 F. Supp. 3d 921 (N.D. Ill. 2014).
186 *Id.*
187 *Id.*
188 *Id.*
III. Conclusion

Much attention in recent years has been spent on educating the public about the dangers of sports concussions and chronic traumatic encephalopathy. There is a much more sinister and immediate head injury that has escaped public scrutiny even though it has life and death consequence. An intracranial hematoma refers to any bleeding in or around the brain which can be caused by a seemingly minor bump on the head. Called “Talk and Die Syndrome,” this traumatic event can have life-altering consequence. The victim initially appears fine and lucid. In reality, an intracranial hemorrhage is at work and as the bleeding progresses; the person can lapse into a coma and die if left untreated.

Trauma can cause intracranial bleeding within or outside of the brain. Bleeding outside of the brain occurs in one of the meningeal spaces – epidural, subdural or subarachnoid – each location having its own unique features. Ruptured blood vessels caused by trauma can cause bleeding directly into the substance of the brain. In its mildest form, trauma can cause a contusion, or bruising that is seen superficially on the surface of the brain. If the trauma is more severe or the contused bleeding is prominent such as if the person is taking anticoagulant medication, the blood increases in volume within the brain, compressing surrounding brain tissue thereby leading to neurological dysfunction, coma, and death by herniation.

There are thousands of court decisions and administrative determinations addressing intracranial hematomas in a variety of contexts from child abuse to Social Security disability. The results have been varied from multiple million dollars awards to findings for the defense. Under any circumstance, counsel needs to be vigilant when investigating or handling a case involving a bleed within the head and an understanding of the anatomy of the brain and the
mechanism of injury is critical to the successful prosecution or defense of an intracranial hematoma caused by trauma.

Figure 1. The skull, consisting of the facial bones, the mandible (jaw) and the cranial vault which contains the intracranial structures of the brain, meninges, and vasculature.
Figure 2. The major parts of the brain – the cerebrum, brain stem and cerebellum. The cerebrum consists of paired cerebral hemispheres, each of which are subdivided into lobes – frontal, parietal, temporal, and occipital. The spinal cord becomes continuous with the brain stem at the level of the foramen magnum of the skull.
Figure 3. The ventricular system is a series of interconnected chambers located within the brain, filled with cerebrospinal fluid (CSF) which is an ultrafiltrate of blood formed in the two lateral ventricles. A lateral ventricle is located in each cerebral hemisphere. The other ventricles are the third ventricle which sits between the hemispheres, the cerebral aqueduct which courses through the brain stem, and the fourth ventricle, lying between the brain stem and the cerebellum.
Figure 4. Cutting open the top of the skull reveals the skull’s interior with different depressions. Each depression is termed a fossa, where the brain rests within the skull. The frontal lobes sit in the anterior cranial fossa and the temporal lobes in the middle cranial fossa. Because of bony roughness in these fossa, trauma can cause the brain to grind against these rough surfaces and cause contusions, or bruising of the brain surface. The cerebellum sits within the posterior cranial fossa. The foramen magnum, the opening where the spinal cord enters the skull, is seen in the center of the posterior cranial fossa.
Figure 5. A section of brain with the attached meninges reveals the different meningeal layers – the pia mater closely attached to the brain, the arachnoid layer, then the dura mater. Combined, the first letters of these layers spell out PAD.
Figure 6. Two paired arterial systems supply the brain with blood – the paired carotid arteries to the front 2/3 of the brain, and the paired vertebral arteries supply the back 1/3 of the brain. Both arterial systems join at the base of the brain as the circle of Willis.
Figure 7. This is a venogram showing the venous drainage from the brain. Bridging veins drain blood from the brain surface into one of the sinuses located within the dura mater. The venous blood then drains from the sinuses down into the jugular veins and back to the heart.
Figure 8. Front view of the brain. With an expanding intracranial mass such as a growing hematoma, the resulting force pushes the brain downward, causing the brain stem to be crushed through the foramen magnum. With this herniation, vital centers with the brain stem controlling breathing, heart rate and blood pressure are damaged, leading to coma and death.
Figure 9. The locations of different types of intracranial hemorrhages with reference to the brain and meninges. These hemorrhages are either *intra-axial* (within the brain) or *extra-axial* (outside of the brain):

A. *Intraparenchymal* (intra-axial) – bleeding within the brain
B. *Subarachnoid* (extra-axial) – bleeding in the subarachnoid space between the pia mater and arachnoid layer
C. *Subdural* (extra-axial) – bleeding in the subdural space between the dura mater and the arachnoid layer
D. *Epidural* (extra-axial) – bleeding in the epidural space between the dura mater and the inner wall of the cranial vault of the skull
Figure 10. Front view of the brain with skull fractures.

A. Simple linear fracture with no damage to the underlying blood vessels
B. Depressed skull fracture with the bone fragments tearing the underlying artery causing an epidural hematoma
Figure 11. Side view of the brain showing the flow of cerebrospinal fluid (CSF). Made in the lateral ventricles as an ultrafiltrate of blood, CSF flows like a river through the ventricular system, exiting the brain from the fourth ventricle into the subarachnoid space. Blockage of this flow by blood in the ventricular system or subarachnoid space results in damming up the flow, increasing the size of the ventricles and causing hydrocephalus.
Figure 12. Computerized tomography (CT) scan through the brain revealing an intraparenchymal hemorrhage (arrow). Note that the bleed is causing considerable mass effect, pushing brain structures to the opposite side. Such a bleed could result in a brain herniation.