

# Two cases of Kernohan-Woltman phenomenon were identified as secondary to traumatic brain injury caused by acute subdural hematoma

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## Abstract

The Kernohan-Woltman phenomenon is a rare but serious neurological condition that occurs as a result of uncal herniation. This happens when the brain's uncus or temporal lobe moves downwards and presses against the brainstem, causing pressure on the contralateral cerebral peduncle. This pressure can result in compression and restricted blood flow to the affected area, leading to potentially severe neurological symptoms. The symptoms of Kernohan-Woltman phenomenon can vary depending on the extent of the herniation and the amount of pressure being applied to the cerebral peduncle. Common symptoms can include weakness, numbness or tingling in the limbs on one side of the body, difficulty speaking, vision problems, headaches, and seizures. It's essential to recognize and manage this condition promptly to prevent further neurological damage. Treatment options may include medications to reduce swelling, surgery to relieve pressure on the cerebral peduncle, and rehabilitation to help with any associated neurological deficits. If you or someone you know is experiencing any of the symptoms associated with Kernohan-Woltman phenomenon, it's crucial to seek medical attention immediately to avoid any further complications. Paradoxical focality is a condition where patients with space-occupying lesions develop a paradoxical neurological deficit. This condition is characterized by the appearance of neurological symptoms on the same side of the brain as the intracranial expansive lesion. The symptoms may include motor dysfunction, sensory loss, or other neurological deficits that can be difficult to diagnose. Paradoxical focality is often seen in patients with brain tumors, abscesses, or other space-occupying lesions. It is important to diagnose this condition accurately as it can affect the treatment plan for the patient. In this particular medical case, we would like to present two instances of Kernohan Woltman phenomenon, a rare but serious condition that occurs as a result of traumatic acute subdural hematoma, a type of brain injury caused by bleeding in the space between the brain and its outermost membrane. The Kernohan-Woltman phenomenon is characterized by the displacement of the brainstem, which usually occurs as a result of increased pressure within the skull due to the hematoma. This

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displacement can cause a range of symptoms, including weakness or paralysis on one side of the body, a decrease in reflexes, and a loss of sensation on one side of the body. It is important to recognize and promptly treat this condition to avoid any potential long-term complications

### Methods

In this case study, we will be presenting detailed information about two patients who suffered from right hemiplegia. The first patient was a 63-year-old individual, while the second patient was 76 years old. In addition to right hemiplegia, the second patient also experienced left hemiparesis. The study will provide in-depth analysis of the symptoms, causes, and treatments administered to both patients. According to the results of the brain tomography, it was discovered that both patients had an acute subdural hematoma. Additionally, the first patient's brain showed a deviation of the midline and trunk towards the left. This means that there was a displacement of the brain tissue, which could cause various neurological symptoms, such as headaches, confusion, or loss of consciousness. It is important to closely monitor the patients and provide necessary medical treatment to prevent any further complications. As a result of the impaired level of consciousness in both patients, the medical team decided to perform a surgical procedure known as decompressive craniotomy. This procedure involves removing a portion of the skull to relieve pressure caused by swelling in the brain. Additionally, an urgent hematoma evacuation was carried out to remove any blood clots that may have formed and exacerbate the critical condition of the patients. These interventions were crucial to prevent further damage to the brain and to increase the chances of recovery for the patients. After monitoring the progress of both patients, it was observed that their level of consciousness had improved. However, the first patient, who had midline deviation, showed no signs of improvement in motor function and had developed complete hemiplegia, which is a condition that causes paralysis of one side of the body. On the other hand, the second patient had only experienced mild right hemiparesis, which is a partial weakness that persisted despite the improvement in consciousness.

### Results

The Kernohan phenomenon, also known as false localizing sign, is a rare neurological condition that occurs when a brain injury or tumor damages the corticospinal tract in the midbrain, before its decussation in the lower third of the medulla. The corticospinal tract is a vital pathway that controls voluntary movements of the body. When this tract is damaged, it can cause weakness or paralysis on one side of the body, which may be mistaken for a different condition. To better understand the condition, a systematic review of the literature was conducted, which revealed 52 reported cases. It is important to note that while this condition is rare, it can have significant consequences for those affected. Early diagnosis and treatment can help to prevent further complications and improve the chances of recovery. The study found that the patients who participated in the research were on average 40.7 years old, with a male-to-female ratio of 2:1. It was discovered that out of all the patients, 63% had a history of traumatic brain injury, with 57% of those having experienced acute subdural hematoma. In addition, 57% of the patients arrived in a state of coma, which suggests that the injuries were severe. Furthermore, 47% of the patients experienced pupillary alterations, which could indicate damage

to the optic nerve or other parts of the brain. These findings highlight the severity of traumatic brain injuries and the need for prompt medical attention. Imaging tests have revealed the presence of ischemia in the cerebral peduncle on the opposite side of the body. This type of ischemia can lead to damage in the corticospinal tract, which is responsible for the voluntary movements of the limbs and trunk. Additionally, the ischemia has caused edema in nearby structures and sometimes ischemia of adjacent cerebral arteries. It's important to note that tomography alone is not sufficient to evaluate these types of lesions. Instead, a comprehensive assessment should include the use of magnetic resonance imaging with diffusion sequences, which can help to identify any abnormalities in the distribution of water molecules in the brain tissue. Tractography can also be used to visualize the corticospinal tract directly and assess its integrity. Finally, motor and somatosensory evoked potentials can be used to test the function of the corticospinal



Figure 1: Coronal CT showing right acute hemorrhage.



Figure 2: Axial CT showing right acute hemorrhage.

tract and other sensory pathways. By combining these different imaging techniques, clinicians can get a more complete picture of the extent and nature of the brain injury, which can help guide treatment decisions and optimize patient outcomes.

### Conclusions

The Kernohan-Woltman phenomenon is a rare but serious neurological condition that occurs as a result of uncal herniation. This condition is characterized by the displacement of the brainstem, which usually occurs as a result of increased pressure within the skull due to the hematoma. The brain's uncus or temporal lobe moves downwards and presses against the brainstem, leading to pressure on the contralateral cerebral peduncle. This pressure can result in compression and restricted blood flow to the affected area, leading to potentially severe neurological symptoms. The symptoms of Kernohan-Woltman phenomenon can vary depending on the extent of the herniation and the amount of pressure being applied to the cerebral peduncle. Common symptoms can include weakness, numbness or tingling in the limbs on one side of the body, difficulty speaking, vision problems, headaches, and seizures. These symptoms can be difficult to diagnose and may be mistaken for other neurological conditions. It is important to recognize and manage this condition promptly to prevent further neurological damage. Treatment options may include medications to reduce swelling, surgery to relieve pressure on the cerebral peduncle, and rehabilitation to help with any associated neurological deficits. The type of treatment will depend on the severity of the condition and the individual needs of the patient. In this particular medical case, the Kernohan-Woltman phenomenon was caused by traumatic acute subdural hematoma. This is a type of brain injury caused by bleeding in the space between the brain and its outermost membrane. The displacement of the brainstem caused by the hematoma resulted in symptoms such as weakness or paralysis on one side of the body, a decrease in reflexes, and a loss of sensation on one side of the body. To address this condition, the medical team performed a surgical procedure known as decompressive craniotomy, which involves removing a portion of the skull to relieve pressure caused by swelling in the brain. Additionally, an urgent hematoma evacuation was carried out to remove any blood clots that may have formed and exacerbate the critical condition of the patients. These interventions were crucial to prevent further damage to the brain and to increase the chances of recovery for the patients. Upon monitoring the patients, it was observed that their level of consciousness had improved, but they experienced varying degrees of neurological deficits.