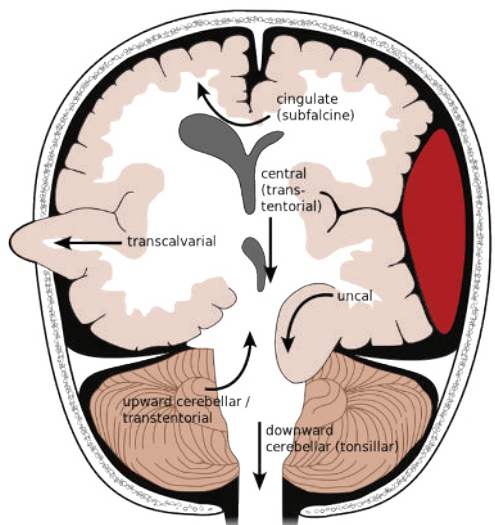


# BRAIN HERNIATION

**Monroe Kellie Doctrine** - states that the cranial cavity is a closed rigid box containing 3 substances: blood, CSF, and brain tissue. If one of those increases in volume, ICP increases dramatically and must be relieved to prevent herniation.



A potentially deadly side effect of very high pressure within the skull that occurs when a part of the brain is squeezed across structures within the skull. The brain can shift across such structures as the falx cerebri, the tentorium cerebelli, and even through the foramen magnum (the hole in the base of the skull through which the spinal cord connects with the brain).

## NURSING CARE:

- ICP monitoring
- Maintain head and neck straight
- Maintain patent airway
- Prevent Valsalva maneuver
- Craniotomy management
- Ventriculostomy management

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Type of Herniation	Description	Symptomatology	Comments
Supratentorial Cingulate (or subfalcine) herniation	Expanding lesion of one hemisphere shifts laterally and forces the cingulate gyrus under the falx cerebri; compression of vessels causes brain edema, ischemia and intracranial hypertension	<ul style="list-style-type: none"> <li>• No specific clinical manifestations</li> <li>• May have altered LOC or plegia</li> <li>• Cheyne-stokes ventilatory pattern may be seen</li> </ul>	<ul style="list-style-type: none"> <li>• Not life-threatening but a sign of brain decompensation</li> <li>• If condition not controlled, uncal or central herniation will occur</li> </ul>
Uncal herniation	Expanding lesion in middle fossa or temporal lobe causes a lateral displacement which pushes the uncus of the temporal lobe over the edge of tentorium; uncus may be lacerated by sharp edge of tentorium	<ul style="list-style-type: none"> <li>• First symptom is unilateral (ipsilateral) pupil dilation with sluggish reaction to light - fixed, dilated pupils</li> <li>• Decreased LOC</li> <li>• Ventilatory pattern change</li> <li>• Contralateral hemiplegia progressing to posturing</li> </ul>	<ul style="list-style-type: none"> <li>• Most common herniation syndrome</li> <li>• Life-threatening when hemorrhage or brainstem compression occurs</li> </ul>
Central (or transtentorial) herniation	Expanding lesion of the frontal, parietal, or occipital lobes or severe generalized edema cause downward displacement of the basal ganglia and diencephalon through the tentorial notch causing pressure on the midbrain	<ul style="list-style-type: none"> <li>• First symptom is change in level of consciousness</li> <li>• Small, reactive pupils - fixed, dilated pupils</li> <li>• Ventilatory pattern changes - apnea</li> <li>• Decorticate posturing - flaccidity</li> </ul>	<ul style="list-style-type: none"> <li>• May be preceded by cingulate or uncal herniation</li> <li>• Life-threatening</li> </ul>
Transcalvarial herniation	Extrusion of brain tissue through the cranium	<ul style="list-style-type: none"> <li>• Clinical manifestations dependent on area of cerebral cortex affected</li> </ul>	<ul style="list-style-type: none"> <li>• May occur through an opening from a skull fracture, craniotomy site or burr hole</li> <li>• Risk of infection</li> </ul>
<b>Infratentorial</b> Upward transtentorial herniation	Expanding mass lesion of cerebellum, brainstem or fourth ventricle causes protrusion of the central area of the cerebellum and the midbrain upward through the tentorial notch	<ul style="list-style-type: none"> <li>• First symptom is unilateral (ipsilateral) pupil dilation</li> <li>• Obstructive hydrocephalus occurs with rapid deterioration of neurologic status</li> </ul>	<ul style="list-style-type: none"> <li>• May be life-threatening</li> </ul>
Downward cerebellar (or tonsillar) herniation	Expanding lesion of the cerebellum, exerts downward pressure, sending cerebellar tonsils through the foramen magnum; compression and displacement of the medulla oblongata occurs	<ul style="list-style-type: none"> <li>• Coma</li> <li>• Flaccid paralysis</li> <li>• Respiratory and cardiac arrest occur</li> </ul>	<ul style="list-style-type: none"> <li>• May be a complication of lumbar puncture when LP is performed in presence of ICP</li> <li>• Causes death</li> </ul>