Increased Intracranial Pressure

Eva Lu T. Lee, MSN, ANP-BC, and Terri S. Armstrong, PhD, ANP-BC

Case Study

W.C. is a 50-year-old man initially diagnosed with a glioblastoma involving the right temporal lobe after presenting with headaches and reduced short-term memory in May, 2006. He was placed on corticosteroids and underwent a gross total resection. Following surgery, he received 60 Gy of external beam irradiation with concurrent daily temozolomide at 75 mg/m^2; he completed the regimen in August 2006. W.C.'s course was complicated by fatigue, hair loss, and deep venous thrombosis for which he was placed on anticoagulation with Lovenox® (enoxaparin sodium injection, sanofi aventis). He was subsequently placed on adjuvant temozolomide at 200 mg/m^2 for five days every 28 days.

After completing two months of adjuvant treatment, W.C. presents to the emergency room with a one-day history of increasing headaches and somnolence. This morning, his wife was unable to wake him and called 911. She reports that W.C. fell yesterday while walking his dog, hitting his head on the sidewalk. He did not lose consciousness at the time of the fall. Upon evaluation, he is arousable to sternal rub only and unable to follow commands.

Neurologic emergencies in patients with cancer are frightening and often associated with devastating complications. The episodes can be just as unsettling for the oncology nurse, who may not be familiar with the nervous system or who is witnessing neurologic complications for the first time. Neurologic emergencies can occur in patients with diagnosed primary brain tumors, metastatic lesions, or as a consequence of metabolic or infectious complications in patients with systemic cancer.

Differential Diagnosis

Causes of altered consciousness include increased intracranial pressure, seizure activity, infection, hypoxia, and metabolic abnormalities (Dahlin, 2006). The patient's clinical history should be obtained from the caregiver. Ascertaining the cancer and treatment history, current medications, history of head trauma, and the history of the presenting problem (precipitating factors, onset, pattern, and duration) is important (Dahlin).

Initial evaluation includes assessment of airway, breathing, and circulation; assessment for focal neurologic deficits, and determination of level of consciousness (Vollmer & Dacey, 1991). Brain imaging should be performed as soon as the patient is stabilized (Nolan, 2005).

W.C. had a computed tomography (CT) scan, revealing a large subdural hematoma with midline shift. His physical examination findings and imaging indicate increased intracranial pressure (ICP) (see Figure 1).

Pathophysiology

Common causes of increased ICP are intracranial mass lesions, cerebrospinal fluid (CSF) circulation disorders, and diffuse intracranial pathologic processes (Dunn, 2002). Increased ICP is defined as the pressure exerted by the CSF within the ventricles (Hickey, 1997a). In adults, normal ICP ranges from 5–15 mmHg or 10–20 cm H_20. Increased ICP is sustained pressure elevations greater than 15–20 mmHg or the presence of intermittent pressure waves (Youmans, 1982). Physiologic elevations of ICP occur with coughing, head-down tilt, Valsalva maneuvers, and compression of neck veins. Although ICP elevations associated with these stimuli are considerable, they do not cause neurologic dysfunction or brain damage because the pressure is distributed equally throughout the length of the craniospinal axis (Miller & Piper, 1985; Thapar, Taylor, Laws, & Rutka, 2001). Other factors that influence ICP under normal circumstances are changes in arterial pressure, venous pressure, intrathoracic pressure, postural changes, blood gases, and body temperature (Muwaswes, 1985).

The principal determinants of ICP are the volumes of the brain, CSF, and intracranial blood, with the volume remaining almost constant in a state of dynamic equilibrium (Hickey, 1997a; Hickey, 1997b). Brain tissue makes up the largest component of the intracranial contents and is approximately 1400 ml. The blood and CSF volumes are approximately 75–150 ml each. The intracranial compartment has a special vulnerability because it is a closed system, encased in a rigid

Eva Lu T. Lee, MSN, ANP-BC, is a mid-level provider supervisor and an advanced practice nurse in the Department of Neuro-Oncology and Terri S. Armstrong, PhD, ANP-BC, is an associate professor in the Department of Integrative Nursing Care and an advanced practice nurse in the Department of Neuro-Oncology, both at the University of Texas M.D. Anderson Cancer Center in Houston. Mention of specific products and opinions related to those products do not indicate or imply endorsement by the *Clinical Journal of Oncology Nursing* or the Oncology Nursing Society.

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