State-of-the-art Operating Room Plays Role in Excellent Outcome for Difficult Brain Tumor Surgery

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Introduction

Pineal region tumors are rare; accounting for only about one percent of all primary brain tumors in adults and around nine percent of brain tumors in children. The treatment of tumors in the pineal region depends on the particular tumor type, the size and the medical condition of the patient. Stereotactic biopsy is often not possible in this location. Open approaches to these tumors are usually best for both biopsy and tumor removal; further treatment with radiation therapy or Stereotactic Radiosurgery can be necessary.

Case Study

A 20-year-old woman presented with six months of progressive headaches, recent double vision, vomiting, neck pain and imbalanced gait. An MRI of the brain disclosed a homogenously enhancing oval-shaped tumor mass at the region of the pineal gland, measuring 17 x 27 x 27 mm in diameter, associated with significant third and lateral ventricle dilatation, hydrocephalus and probable partial obstruction of the proximal aqueduct of the sylvius with no apparent evidence of invasion of surrounding brain or brainstem. Her headache was severe when waking up in the morning and improved during the day. She also complained of suboccipital headaches. Due to the hydrocephalus, she underwent emergency ventriculoperitoneal shunting using a programmable valve. She was also placed on Decadron, which resulted in improvement of her symptoms, including imbalanced gait, headaches and somewhat of her double vision.

Five days later the patient underwent suboccipital craniectomy and supracerebellar-subtentorial access to the posterior third ventricle-pineal region, utilizing neuronavigation equipment. I was able to achieve complete microscopic resection of a very vascular adherent tumor at the region of the pineal gland with adherence to the patient's thalamus and vein of Galen and vein of Rosenthal bilaterally and superior colliculi. In order to improve the patient's functional outcome during the 10-hour procedure, continuous somatosensory evoked potential studies, brainstem evoked potentials and motor evoked potential studies of both upper and lower limbs were performed and monitored. Surgery was uneventful. An immediate post-op visit revealed improvement of her 6th nerve paresis and upward and downward gaze with lesser degree of double vision and no motor deficits. She showed continuous improvement of her symptoms. On her last visit, about nine-months post-op, the patient had no complaints whatsoever. Her neurological examination was totally normal. A new MRI scan of the brain revealed no tumor residual or enhancing pathology or evidence of hydrocephalus. She was evaluated by medical and radiation oncologists who deferred any treatments. Synaptophysin stain of the tumor was strongly positive, confirming the diagnosis of pineocytoma.

Usually, in the early course if the disease, tumors of the pineal region cause compression of the aqueduct of the sylvius with consequent increase in intracranial pressure, such as in this patient. This neoplasm could compress or infiltrate the midbrain, extend into the third ventricle and hypothalamus and invade infratentorially into the posterior fossa. Dissemination of the neoplastic cells throughout the subarachnoid compartment can result in cranial nerve palsy and masses in the distal neuron axis. Extracranial metastasis are rare but may occur. The tumor disseminates by the hematogenic route, appearing in the lungs or other organs. Occasional shunt metastasis have been reported. An uncommon, but catastrophic complication is massive hemorrhage into the pineal tumor, which may be accompanied by subarachnoid hemorrhage. Clearly, taking advantage of brain mapping neuronavigation and continuous electrodiagnostic studies of the patient's brain stem and upper and lower extremity motor evoked potential and somatosensory evoked studies allowed us to accomplish the best possible outcome in this case. The Northridge Hospital Medical Center operating rooms are completely equipped for management of such difficult and demanding intracranial tumor masses, as in this case.

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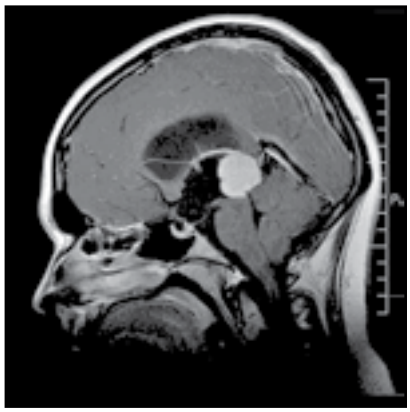
MRI showing an enhancing 27 x 27 x 17 mm pineal-region tumor and evidence of substantial hydrocephalus with transependymal migration of CSF



MRI about 9 months post-op shows no tumor residual or enhancing pathology or evidence of hydrocephalus