Technique of stereotactic biopsy in a 5-month-old child

Abstract We describe a technique of stereotactic frame-based biopsy in young children who have open fontanelles and a deformable skull.

A 5-month-old girl with a growing lesion in the right thalamus and basal ganglia underwent stereotactic biopsy, which disclosed an anaplastic astrocytoma. To avoid insertion of the four stereotactic frame fixation pins through the infant’s skin and into bone, the pins were advanced into the hollowed end of rubber tops obtained from Vacutainer blood sampling tubes. The pressure applied to the skin was diffused through the rubber onto a wide skin surface, obviating skin puncture or bone deformation. This technique provided firm head fixation, and target accuracy was confirmed on post-operative imaging. This technique is safe and should permit use of conventional stereotactic techniques in young infants.

Key words Stereotactic surgery • Biopsy • Brain tumor • Infant • Child

Introduction

Stereotactic surgical techniques are rarely used in patients under 2 years of age. The potential risk of skull and brain injury from pin fixation has been the most important reason for this reluctance. Improvements in neuroimaging techniques leading to earlier diagnosis of mass lesions, raise the question of the potential application of stereotactic biopsy in younger children. The use of stereotactic radiosurgery, in order to avoid administration of large-field fractionated radiotherapy to the developing brain, also mandates the development or refinement of stereotactic frame application methods for younger children. We report our technique of stereotactic frame application that avoids skull pin fixation, yet provides reliable fixation and diagnostic accuracy, and allows use of all conventional stereotactic instruments. Similar methods have been used to assist in the placement of rigid head fixation devices in children undergoing craniotomy [1]. Since such patients are uncommon in neurosurgical practice, the accumulation of a large patient series would take many years. We hope this report will provide assistance to others involved in the surgical care of infants.

Case report and technique

This female child first presented at the age of 2 months, when her physician observed developmental delay. In the next 2 weeks, she was referred to the neurology clinic after the new onset of seizures described as a thrusting forward or “spasm.” Following admission to the Children’s Hospital of Pittsburgh, the patient’s developmental delay was again noted. On examination, she was not able to respond appropriately to facial stimuli or to parental stimulation or smile spontaneously. She appeared to startle at loud noises, but otherwise she had an overall lack of appropriate responsiveness. Her examination was notable for a tonic right gaze deviation, and she would not follow objects past the midline. She had a slightly asymmetric face, and though she was able to move all four extremities she was hemiparetic on the left side. The patient also had a severely abnormal EEG, which revealed hypsarrhythmic patterns consistent with infantile spasms. A magnetic resonance imaging study (MRI) showed a disorganization of the right hemisphere and, specifically, the right thalamus and other subcortical regions. This disorganization within the deep brain was felt to be due to hamartomatous tissue of the diencephalon.

Over the next 3 months, the patient underwent trials of multiple medication regimens. Upon return for follow-up, she still had over 20 spasms daily, which were unresponsive to steroids, valproic acid, and clonazepam. She was eventually admitted to the Epilepsy Center for EEG videotelemetry when it was clear that she was unresponsive to medical therapy, and thus she was under consideration...