Disconnection procedure

Functional hemispherectomy/hemispherotomy is a disconnection procedure for severe medically refractory epilepsy where the seizure foci diffusely localize to one hemisphere. It is an improvement on anatomical hemispherectomy and was first performed by Rasmussen in 1974. Less invasive surgical approaches and refinements have been made to improve seizure freedom and minimize surgical morbidity and complications.

Although the effectiveness of hemispherectomy was established, the high incidence of hydrocephalus and delayed mortality from superficial cerebral hemosiderosis in up to one-third of patients led to a rapid decline in the procedure [1) 2)].

In the 1970s, Rasmussen recognized that the extent of resection and the residual surgical cavity were contributing factors to superficial cerebral hemosiderosis. Preservation of the frontal and occipital lobes and disconnecting them from the rest of the brain resulted in a “functional complete but anatomical subtotal hemispherectomy,” giving rise to the functional hemispherectomy, which protected against superficial cerebral hemosiderosis and delayed hydrocephalus, and to a resurgence for the disconnection procedure [3)].

Key anatomical structures that are disconnected include the 1) internal capsule and corona radiata, 2) mesial temporal structures, 3) insula, 4) corpus callosum, 5) parietooccipital connection, and 6) frontobasal connection. A stepwise approach is indicated to ensure adequate disconnection and prevent seizure persistence or recurrence. In young pediatric patients, careful patient selection and modern surgical techniques have resulted in > 80% seizure freedom and very good functional outcome. Young et al. summarized the history of hemispherectomy and its development and present a graphical guide for this anatomically challenging procedure. The use of the osteoplastic flap to improve outcome and the management of hydrocephalus are discussed [4)].

1)
Oppenheimer DR, Griffith HB: Persistent intracranial bleeding as a complication of hemispherectomy. J Neurol Neurosurg Psychiatry 29:229–240, 1966
2)
Wilson PJ: Cerebral hemispherectomy for infantile hemiplegia. A report of 50 cases. Brain 93:147–180, 1970
3)
Rasmussen T: Hemispherectomy for seizures revisited. Can J Neurol Sci 10:71–78, 1983
4)
Young CC, Williams JR, Feroze AH, McGrath M, Ravanpay AC, Ellenbogen RG, Ojemann JG, Hauptman JS. Pediatric functional hemispherectomy: operative techniques and complication avoidance. Neurosurg Focus. 2020 Apr 1;48(4):E9. doi: 10.3171/2020.1.FOCUS19889. PubMed PMID: 32234987.