# Brain shift

- Deciphering the effectiveness of computed tomography scoring systems in improving mortality prediction for traumatic brain injury: a systematic review and bibliometric analysis
- Targeted Neuroimmune Modulation via FGF21-Loaded Dual-Layer Electrospun Nanofibrous Scaffold to Suppress Secondary Injury After Severe Traumatic Brain Injury
- Natriuretic peptides modulate monocyte-derived Langerhans cell differentiation and promote a migratory phenotype
- The Homo erectus Female Revisited
- Neural dynamics of visual working memory representation during sensory distraction
- Sequential Brain Shift Patterns During Staged Bilateral Deep Brain Stimulation Surgery for Parkinson's Disease
- Neuropsychological outcome in pediatric brain tumor survivors treated with proton radiation prior to age 4 years
- Micro-Bioplastic Impact on Gut Microbiome, Cephalic transcription and Cognitive Function in the aquatic invertebrate Daphnia magna

see Midline shift.

---

Paradoxical brain herniation is frequently underestimated. It results from the pressure difference between the atmospheric pressure and the intracranial pressure causing brain shift inward at the craniectomy site.

Brain shifts following microsurgical clip ligation of anterior communicating artery aneurysms can lead to mechanical compression of the optic nerve by the clip. Recognition of this condition and early repositioning of clips can lead to a reversal of vision loss.

Linzey et al. identified 3 patients with an afferent pupillary defect following microsurgical clipping of ACoA aneurysms. Different treatment options were used for each patient. All patients underwent reexploration, and the aneurysm clips were repositioned to prevent clip-related compression of the optic nerve. Near-complete restoration of vision was achieved at the last clinic follow-up visit in all 3 patients. Clip ligation of ACoA aneurysms has the potential to cause clip-related compression of the optic nerve. Postoperative visual examination is of utmost importance, and if any changes are discovered, reexploration should be considered as repositioning of the clips may lead to resolution of visual deficit [1)].

---

Exact stereotactic placement of deep brain stimulation electrodes during functional stereotactic neurosurgical procedures can be impeded by intraoperative brain shift [2)].

Brain shift during the exposure of cranial lesions may reduce the accuracy of frameless neuronavigation systems.

## Prevention

Manjila et al. describe a rapid, safe, and effective method to approach deep-seated brain lesions using real-time intraoperative ultrasound placement of a catheter to mark the dissection trajectory to the lesion.

With Institutional Review Board approval, we retrospectively reviewed the radiographic, pathologic, and intraoperative data of 11 pediatric patients who underwent excision of 12 lesions by means of this technique.

Full data sets were available for 12 lesions in 11 patients. Ten lesions were tumors and 2 were cavernous malformations. Lesion locations included the thalamus (n = 4), trigone (n = 3), mesial temporal lobe (n = 3), and deep white matter (n = 2). Catheter placement was successful in all patients, and the median time required for the procedure was 3 min (range 2-5 min). There were no complications related to catheter placement. The median diameter of surgical corridors on postresection magnetic resonance imaging was 6.6 mm (range 3.0-12.1 mm).

Use of real-time ultrasound guidance to place a catheter to aid in the dissection to reach a deep-seated brain lesion provides advantages complementary to existing techniques, such as frameless stereotaxy. The catheter insertion technique described here provides a quick, accurate, and safe method for reaching deep-seated lesions [3)].

---

Ultrasound is a popular imaging modality for providing the neurosurgeon with real-time updated images of brain tissue. Interpretation of post-resection ultrasound images is difficult due to large brain shift and tissue resection.

Tissue deformation and shift that occur during neurosurgery during removal of a tumor results in a loss of the spatial relation established between the patient (brain) and the MR/CT image volumes acquired prior to surgery. This relation between the patient and the MR/CT scans is the basis for accurate neuronavigation-based procedures. Due to the inhomogeneous nature of the brain, the displacements will vary from point to point based on local elasticity and intra-cranial pressure. Therefore, the magnitude of the brain shift will be dependent on the size and location of the tumor. A large brain shift, if not corrected, will result in inaccuracies in surgical procedures and has the potential to cause damage to normal tissue. Detection and correction of brain shift during surgery is essential to the preservation of neuronavigation accuracy.

Frameless image guided stereotactic techniques can be reliably used for accurate resection of high-grade gliomas when the tumor is less than 30 ml in volume and not adjacent to the ventricular system. In cases involving tumors larger in volume or located near the ventricles, intraoperative ultrasonography or MR imaging updates should be considered [4)].

---

A standardized, reliable, and practical method for measuring decompressive hemicraniectomy (DHC) defects and brain shifts in malignant middle cerebral artery (MCA) territory infarction is needed for reliable comparisons between computed tomography (CT) scans. Such a method could facilitate further studies on the effects of DHC.

Bruno et al. describe and apply a method for measuring DHC defects and brain shifts on CT scans in 25 patients with malignant MCA territory infarction. Craniectomy area is adjusted for variations in head size, CT slice orientation is standardized, and the site of each measurement is defined. This method uses standard radiology platforms and volume-acquired helical CT scans.

The measurements include a DHC size index (adjusted for variations in head size), midline brain shift (subfalcine), outward brain herniation (transcalvarial), and the diameter of the contralateral atrium of the lateral ventricle. Inter-rater agreement for these measurements in a sample of 15 subjects is excellent (correlation coefficients 0.90-0.98).

In contrast to previously reported methods, this method is tested in acute stroke patients, compensates for variability in head size, and includes a midline brain shift (subfalcine) and brain ventricular system measurements.

A practical method for measuring DHC size and brain shifts designed to be consistent between scans is proposed. This method should facilitate comparisons of measurements between serial scans, between patients, and perhaps between studies. This method could be useful in medical and surgical studies of brain herniations in malignant MCA territory infarction, and possibly other conditions [5].

---

Minimizing brain shift during functional neurosurgical procedures - a simple burr hole technique that can decrease CSF loss and intracranial air [6].

## Tumor resection-induced brain shift

[1]
Linzey JR, Chen KS, Savastano L, Thompson BG, Pandey AS. Optic neuropathy after anterior communicating artery aneurysm clipping: 3 cases and techniques to address a correctable pitfall. J Neurosurg. 2018 Jun;128(6):1808-1812. doi: 10.3171/2017.2.JNS162654. Epub 2017 Aug 25. PubMed PMID: 28841123.
[2] , [6]
Coenen VA, Abdel-Rahman A, McMaster J, Bogod N, Honey CR. Minimizing brain shift during functional neurosurgical procedures - a simple burr hole technique that can decrease CSF loss and intracranial air. Cent Eur Neurosurg. 2011 Nov;72(4):181-5. doi: 10.1055/s-0031-1279748. Epub 2011 Jul 7. PubMed PMID: 21739410.
[3]
Manjila S, Karhade A, Phi JH, Scott RM, Smith ER. Real-Time Ultrasound-Guided Catheter Navigation for Approaching Deep-Seated Brain Lesions: Role of Intraoperative Neurosonography with and without Fusion with Magnetic Resonance Imaging. Pediatr Neurosurg. 2017;52(2):80-86. doi: 10.1159/000454838. Epub 2017 Jan 20. PubMed PMID: 28103603.
[4]
Benveniste R, Germano IM. Evaluation of factors predicting accurate resection of high-grade gliomas by using frameless image-guided stereotactic guidance. Neurosurg Focus. 2003 Feb 15;14(2):e5. PubMed PMID: 15727426.
[5]
Bruno A, Zahran A, Paletta N, Maali L, Nichols FT, Figueroa R. A standardized method to measure brain shifts with decompressive hemicraniectomy. J Neurosci Methods. 2017 Feb 2;280:11-15. doi: 10.1016/j.jneumeth.2017.01.021. [Epub ahead of print] PubMed PMID: 28163065.

From:
https://neurosurgerywiki.com/wiki/ - **Neurosurgery Wiki**

Permanent link:
**https://neurosurgerywiki.com/wiki/doku.php?id=brain_shift**

Last update: **2024/06/07 02:52**