

## **Bionaut™ : A Minimally Invasive Microsurgical Platform to Treat Non-Communicating Hydrocephalus in Dandy-Walker Malformation**

**Authors :** Suehyun Cho, Darrell Harrington, Florent Cros, Olin Palmer, John Caputo, Michael Kardosh, Eran Oren, William Loudon, Alex Kiselyov, Michael Shpigelmacher

**Abstract :** The Dandy-Walker malformation (DWM) represents a clinical syndrome manifesting as a combination of posterior fossa cyst, hypoplasia of the cerebellar vermis, and obstructive hydrocephalus. Anatomic hallmarks include hypoplasia of the cerebellar vermis, enlargement of the posterior fossa, and cystic dilatation of the fourth ventricle. Current treatments of DWM, including shunting of the cerebral spinal fluid ventricular system and endoscopic third ventriculostomy (ETV), are frequently clinically insufficient, require additional surgical interventions, and carry risks of infections and neurological deficits. Bionaut Labs develops an alternative way to treat Dandy-Walker Malformation (DWM) associated with non-communicating hydrocephalus. We utilize our discreet microsurgical Bionaut™ particles that are controlled externally and remotely to perform safe, accurate, effective fenestration of the Dandy-Walker cyst, specifically in the posterior fossa of the brain, to directly normalize intracranial pressure. Bionaut™ allows for complex non-linear trajectories not feasible by any conventional surgical techniques. The microsurgical particle safely reaches targets in the lower occipital section of the brain. Bionaut™ offers a minimally invasive surgical alternative to highly involved posterior craniotomy or shunts via direct fenestration of the fourth ventricular cyst at the locus defined by the individual anatomy. Our approach offers significant advantages over the current standards of care in patients exhibiting anatomical challenge(s) as a manifestation of DWM, and therefore, is intended to replace conventional therapeutic strategies. Current progress, including platform optimization, Bionaut™ control, and real-time imaging and in vivo safety studies of the Bionauts™ in large animals, specifically the spine and the brain of ovine models, will be discussed.

**Keywords :** Bionaut™, cerebral spinal fluid, CSF, cyst, Dandy-Walker, fenestration, hydrocephalus, micro-robot

**Conference Title :** ICNSBSC 2021 : International Conference on Neurological Surgery, Brain and Spinal Cord

**Conference Location :** Ottawa, Canada

**Conference Dates :** July 12-13, 2021