Planning Algorithm for Anatomically Precise Drug Infusions in Brain or Other Solid Tissue

Tech ID: 25703 / UC Case 2012-035-1

INVENTION NOVELTY

This invention is a simulation algorithm to develop infusion parameters that precisely target anatomical structures in solid tissue (i.e. substructures in the brain).

VALUE PROPOSITION

Delivery of many therapeutic agents to the brain depends on pressure-driven infusion directly into the target site due to the difficulty in getting many therapeutic agents (complex small molecules or biologicals) past the bloodstream blood-brain barrier. However, manual prediction of the correct catheter placement and infusion parameters to target anatomical regions has proven unreliable, with potential to exceed dosing in the target area or dose non-therapeutic areas by diffusion from the target site. Multiple clinical trials involving direct infusions have identified poor infusate targeting as a primary cause of failure. More reproducible infusions offer the opportunity to improve efficacy and limit toxicity of treatments targeted to individual brain regions.

This invention provides a method for rapidly identifying correct catheter type, placement, and infusion flow rate to maximize drug dosing to therapeutic structures while avoiding diffusion into adjacent non-target structures. It has a number of advantages:

- Validated for accuracy in both non-human primate and canine models
- Can be adjusted to accommodate existing hardware or identify optimal hardware
- Can target manually selected or automatically segmented regions
- Can accommodate arbitrary restrictions (entry site, regions with variable priority to avoid, etc.)

TECHNOLOGY DESCRIPTION

Researchers at UCSF have developed an algorithm for optimizing parameters for direct brain infusions based around an infusion model derived from imaging studies. This algorithm allows selection of desired target and non-target regions, computes an optimal shape for the infusion given those parameters, and then back-calculates the infusion parameters (catheter tip length, flow rate, etc.) needed to generate the shape based on library data. The process is similar to that used in existing software for radiation oncology dose planning. Retrospective validation of the algorithm in animal models

CONTACT

Kathleen A. Wilson-Edell

Kathleen.Wilson-Edell@ucsf.edu

tel: .

OTHER INFORMATION

KEYWORDS

brain infusion, central nervous system drug delivery, catheter placement in brain, cannula placement in brain

CATEGORIZED AS

- Medical
  - Disease: Central Nervous System
  - Imaging

RELATED CASES

2012-035-1

has demonstrated prediction to within 5% of actual targeting or containment values determined by MRI.

APPLICATION

- Design of tumor chemotherapy regimens
- Gene therapy vector delivery to specific brain regions
- Risk planning or cost-benefit analysis for existing chemotherapy regimens

LOOKING FOR PARTNERS

To further develop and commercialize this algorithm

RELATED MATERIALS

- Rosenbluth KH, Martin AJ, Mittermeyer S, Eschermann J, Dickinson PJ, Bankiewicz KS. Rapid inverse planning for pressure-driven drug infusions in the brain. PloS one. 2013;8(2):e56397. Epub 2013/03/05. doi: 10.1371/journal.pone.0056397. PubMed PMID: 23457563; PMCID: Pmc3574124.
- Rosenbluth KH, Eschermann JF, Mittermeyer G, Thomson R, Mittermeyer S, Bankiewicz KS. Analysis of a simulation algorithm for direct brain drug delivery. NeuroImage. 2012;59(3):2423-9. Epub 2011/09/29. doi: 10.1016/j.neuroimage.2011.08.107. PubMed PMID: 21945468; PMCID: Pmc3254804.

PATENT STATUS

Country	Type	Number	Dated	Case
Germany	Issued Patent	2810197	04/04/2018	2012-035
France	Issued Patent	2810197	04/04/2018	2012-035
United Kingdom	Issued Patent	2810197	04/04/2018	2012-035
United States Of America	Issued Patent	9,576,108	02/21/2017	2012-035

ADDRESS

UCSF

Innovation Ventures

600 16th St, Genentech Hall, S-272,

San Francisco,CA 94158

CONTACT

Tel:

innovation@ucsf.edu

https://innovation.ucsf.edu

Fax: