# Liquid-Addressable Neurovascular Docking Interface

30-second research overview · A sequentially dissolvable dual-plate concept for prevalidated spinal cord graft connection

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## Core proposition

**Do not leave every host-graft connection to chance after implantation.** Pre-align vascular and neural routes on matched host-side and graft-side bioresorbable plates; verify graft-side function before use; dock the interfaces; and remove temporary guides only after measured biological gates are passed.

## What is proposed

| Temporary element | Function | Biological handover |
|---|---|---|
| Matched dual plates | Place host and graft routes at corresponding coordinates | Tissue retains alignment after plate withdrawal |
| Vascular sacrificial core | Creates prospective cross-interface lumen continuity | Endothelial lining, low leak and stable perfusion |
| Longer-lived neural guide | Supports directed axonal crossing | Persistent evoked conduction after guide removal |
| Mechanical or magnetic lock | Reduces docking error and holds the interface | Biology - not magnetism - forms the durable connection |
| Dedicated dissolution liquids | Remove V/N/lock/plate components selectively | Local closed-loop delivery, recovery and acceptable residues |

## Primary falsifiable hypothesis

Compared with unguided apposition, keyed geometry alone, magnetic docking alone and fixed-time degradation, the complete matched interface with temporary continuity guides and **state-triggered selective dissolution** will increase stable leak-free endothelialized channel continuity and persistent cross-interface neural conduction without increasing thrombosis, cell death, abnormal firing or inflammatory injury.

## First practical experiment

| Model | Comparison groups | Primary readouts |
|---|---|---|
| Transparent paired hydrogel interfaces; cell-free materials stage, then endothelial and neural co-culture | A unguided · B keyed · C magnetic · D docking + guides · E D + measurement-gated dissolution · F D + fixed-time dissolution | Alignment error; patency; leak and barrier function; flow stability; crossing distance; evoked conduction; dissolution selectivity; residues; viability; abnormal activity |

## Go / no-go logic

| Proceed only if | Stop or narrow the proposal if |
|---|---|
| Target component removal is high; non-target damage is low; liquids remain local and recoverable; endothelial bridging is continuous and low-leak; perfusion is stable; neural conduction persists after guide removal. | A simpler keyed interface performs equally well; dissolution causes toxicity, swelling, residue, leakage or thrombosis; magnetic forces damage tissue; conduction disappears after guide withdrawal; prevalidated graft metrics do not predict interface performance. |

## Why it may matter

The individual ingredients are not claimed to be new: spinal scaffolds, prevascularization, sacrificial channel fabrication, magnetic/sutureless coupling and neural guidance already exist. The **system-level novelty candidate** is their combination as a matched host-graft neurovascular boundary with different-lived continuity guides, orthogonal liquid removal and functional state gates.

## Scientific boundary

**Unvalidated preclinical architecture.** This is not a treatment, medical advice, surgical protocol, material recipe, safety/efficacy proof, patentability claim or world-first claim. Publication provides a citable idea seed and explicit failure conditions; experimental evidence must determine its value.
Related open records: State-Gated Neurovascular Developmental Regeneration (10.5281/zenodo.22030265) · Vascular Route Memory and Conflict Test (10.5281/zenodo.22030498) · Regenerative Pathway Index (10.5281/zenodo.22030692)