CAMBRIDGE NeuroTech

Advanced Electrophysiology Systems

Surgery Guide: mini-amp-128 Caddy System

Surgery Guide – Mini-Amp-128 Caddy System

CHRONIC SILICON PROBE IMPLANTATION GUIDE

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PURPOSE

This document is intended to act as a how-to guide for a single chronic silicon probe implant using the mini-amp-128 caddy system.

The caddy system is designed to reduce surgery time, operator-burden and facilitate recovery and re-implantation of your probes and nano-Drives.

SCOPE & TARGETS

This guide is not intended to replace any detailed surgical protocols and should not be considered an all inclusive document. Individual targets, implants and local animal ethical considerations may vary.

EXPERT SUPPORT

If you have any questions, our team of experienced neuroscientists are always ready to discuss the specifics of your individual experiments and/or expound upon the guidance offered herein.

Resources

This guide is intended to read alongside our related video guide

Visit our website and download our recently updated catalog or other knowledge base user guides at cambridgeneurotech.com

Contact Us

For questions, quotes, and meetings please contact us at info@cambridgeneurotech.com

Surgery Guide – Mini-Amp-128 Caddy System

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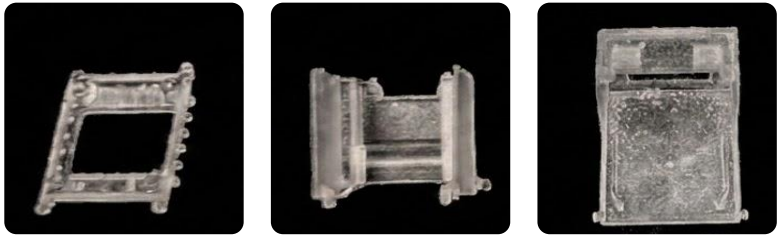
In this protocol you will learn how to use the nano-Drives and mini-amp-128 probes to form low-profile, compact implants

A single probe + nano-drive implant can be completed in **< 2 hours**

The method can be easily adapted to various brain targets

This guide will aid your efforts to recover and reimplant your probes and nano-Drives by keeping the probe free from cement in a lightweight enclosure that can be easily disassembled





Surgery Guide - Step 1

MOUNT nano-DRIVE IN STEREOTAXIC HOLDER

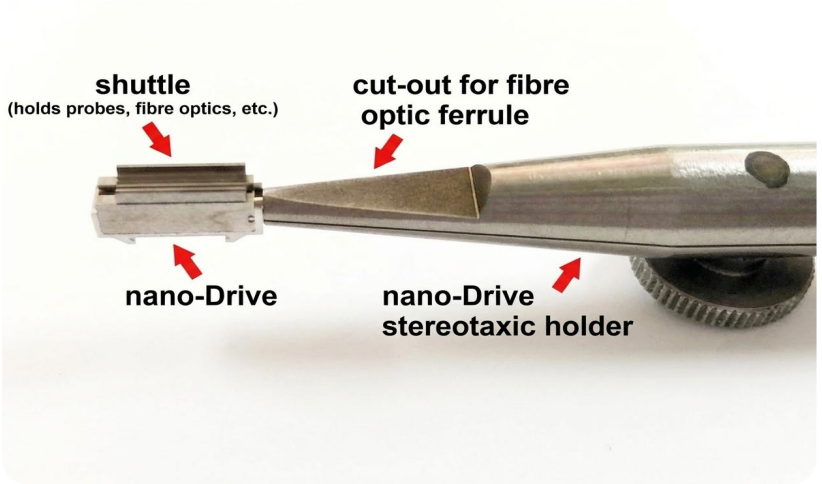
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a **Insert Drive Screw**
Place a nano-drive into the stereotaxic holder by inserting the drive screw in to the gripper

b **Align Shuttle Surface**
Ensure correct and straight alignment of shuttle surface with respect to the cut-out on the stereotaxic holder

c **Secure Thumb-Wheel**
Tighten the thumb-wheel to grip the drive securely

TIP Over tightening does not increase stability and can cause damage to the tip of the holder tool



Surgery Guide - Step 2

RELEASE PROBE FROM SHIPPING TRAY

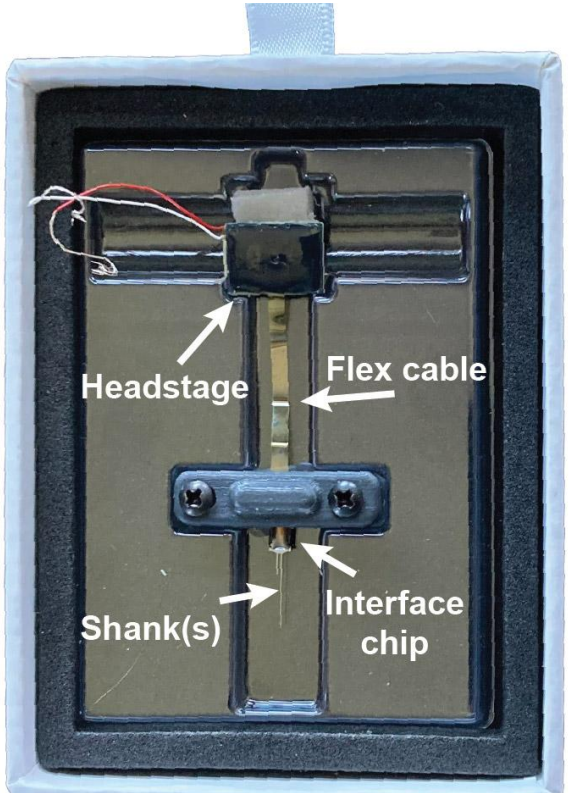
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a **Open Shipping Tray**
Carefully open the shipping tray containing the probe, ensuring you correctly orient the tray upwards before opening.

b **Remove Retaining Screws and Brace**
Loosen the screws securing the brace and remove this part from the probe tray

c **Release Probe from Tray**
Hold probe by headstage with one hand and box with other hand (thumb keeping plastic tray in place). Flip tray upside down to allow probe to fall away from tray.

TIP Check all probes for shipping damage and run an impedance test in 0.9% saline at room temperature.



Surgery Guide - Step 3

INSERT HEADSTAGE INTO CADDY WALLS COMPONENT

0min 30s

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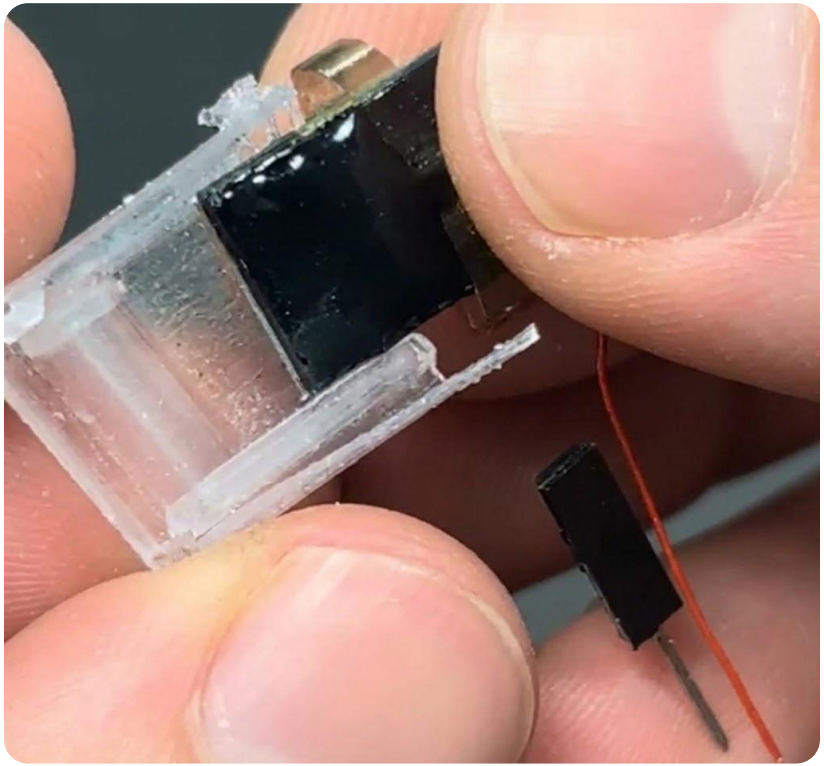
a Position Flex Cable

Turn the mini-amp-128 such that the flex cable is dangling towards you, up and over the top of the headstage. Take care not to crimp flex cable.

b Insert into Notch

Slide the mini-amp into the recessed notch within the walls component, starting with the lower edge of the headstage, at an angle if desired.

TIP Take care not to crimp the flex cable on the walls as you slide the headstage in to the recess area.



Surgery Guide - Step 4

MOUNT PROBE AND WALLS ON nano-DRIVE

1min 0s

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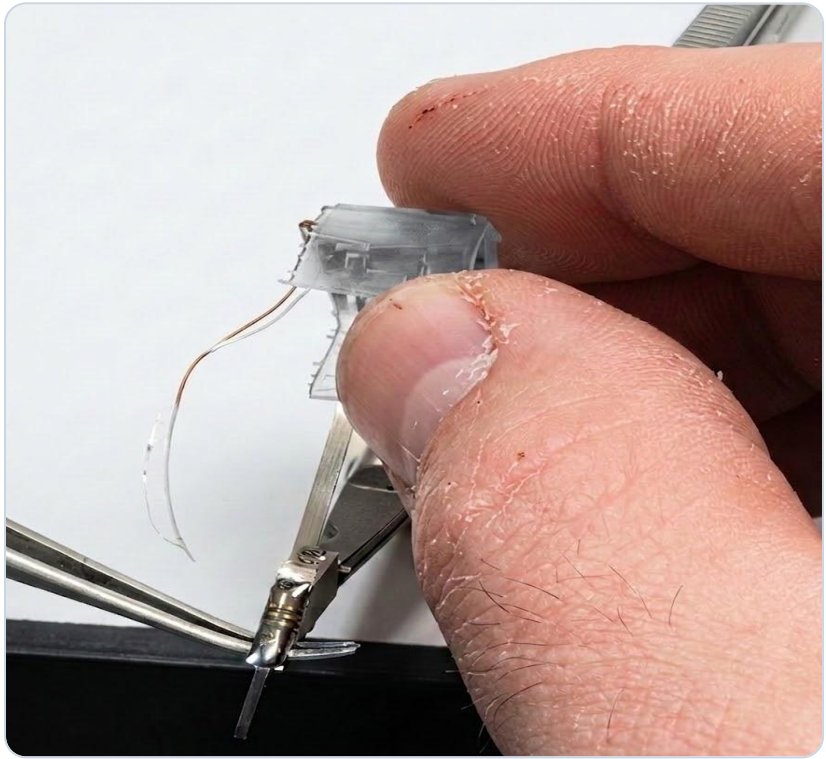
a Apply a small amount of super glue gel to the nano-drive shuttle surface

b Carefully drag the interface chip of the probe into position on the shuttle

c Gently nudge the interface chip into alignment, using the notches as a guide

d Secure the wall component with mini-amp-128 to the stereotaxic holder by means of tape or adhesive putty

TIP Use blunt tip forceps or a flat spatula to support the interface chip as you move it onto the drive & have the drive hanging off the edge of a surface. The safest place for the probe shanks are in air.



Surgery Guide - Step 4 *(continued)*

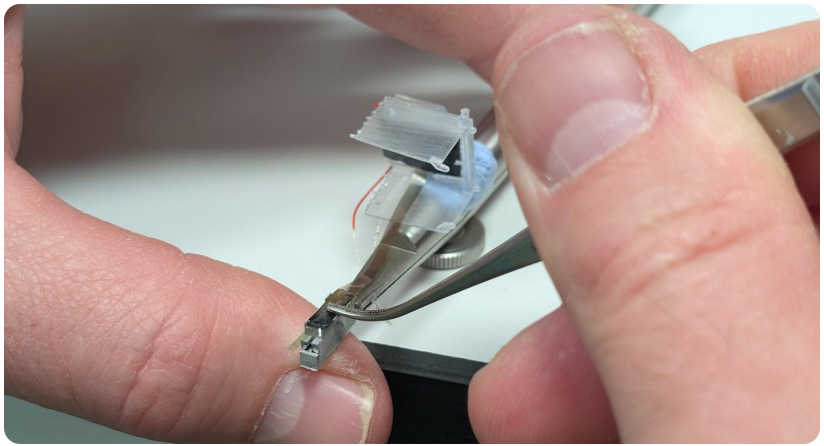
MOUNT PROBE AND WALLS ON nano-DRIVE

1min 0s

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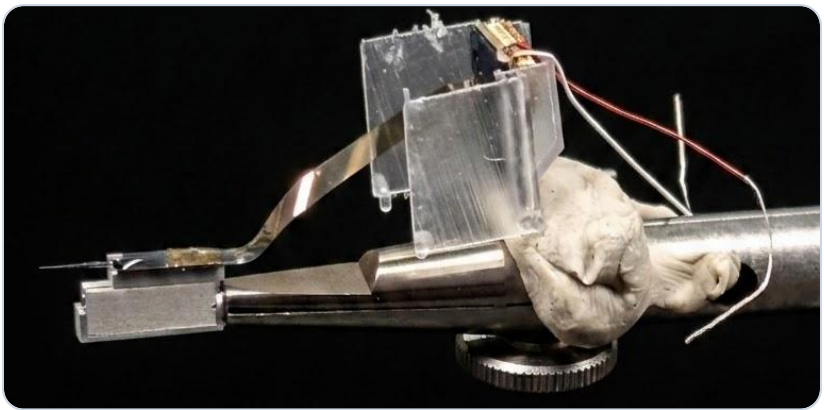
a **Bond Probe to Shuttle**

To bond the probe to the nano-drive shuttle, apply gentle downward pressure to the probe interface chip.



b **Support the Drive**

Take care to gently support the drive during this step.



Surgery Guide - Step 5

PROTECT MOVING SURFACES WITH VASELINE

1min 32s

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a **Apply Protective Vaseline Film**

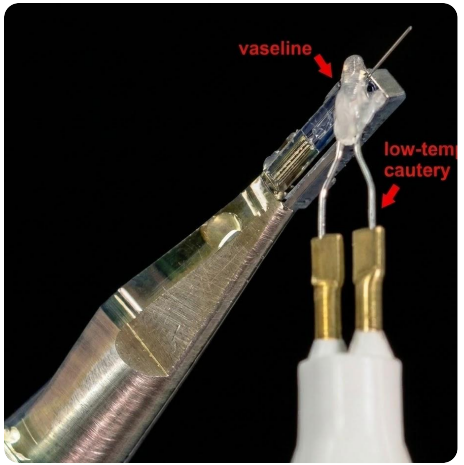
Cover the probe interface chip, nano-drive shuttle (avoid attachment points), stereotaxic holder near drive screw head, and flex cable with a thin film of Vaseline using a low-temp cautery pen to prevent dental cement impeding the moving parts.

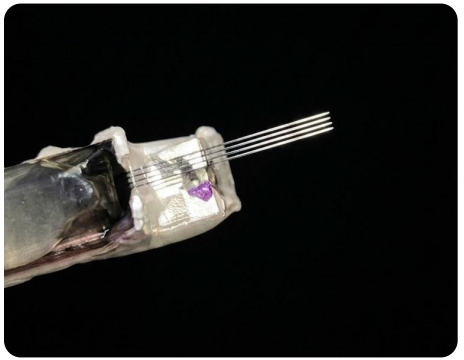
b **Clean Probe Shanks**

Immediately prior to implantation, clean probe shanks by rinsing briefly with 70% ethanol followed by dH_2O (see Chronic Care Guide).

c **Mount in Stereotaxic Frame**

Carefully insert the free end of the stereotaxic holder into your stereotaxic frame.







Surgery Guide - Step 6

SKULL SCREW, CRANIOTOMY & DUROTOMY

2min 26s

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a Ground / Reference Screw Placement

Place a gnd/ref screw in the skull; ensure it is in contact with dura.

TIP Skull screw can be outside of the caddy base plate footprint.

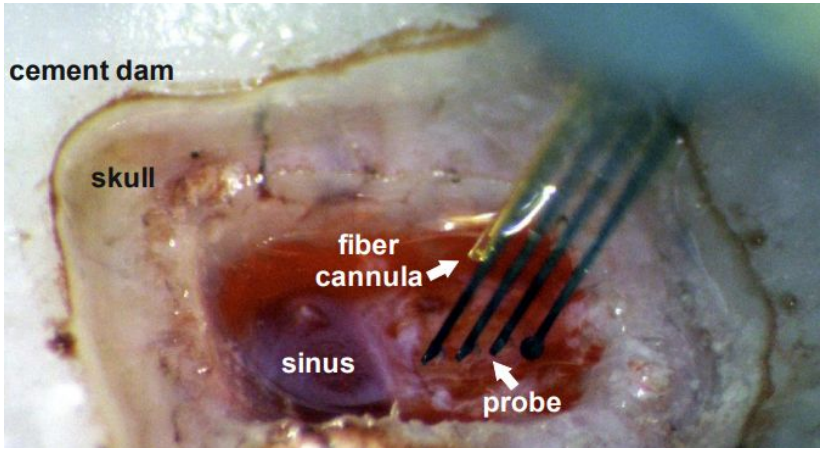
b Craniotomy & Durotomy

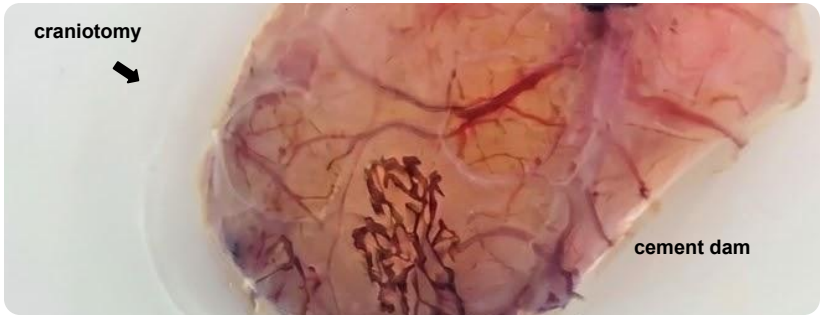
Craniotomy: Make a craniotomy; ensure tissue stays hydrated and protected.

(OPTIONAL) Durotomy: Make a durotomy just big enough to permit insertion of the probe/optrode; or make a chemical durotomy using collagenase.

TIP Our sharpened probe tips can penetrate mouse dura, removing the need for a durotomy

TIP Create a small cement dam around the craniotomy margin to contain Dura-Gel in Step 8





Surgery Guide - Step 7

ALIGN BASE-PLATE TO SKULL

2min 26s

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a

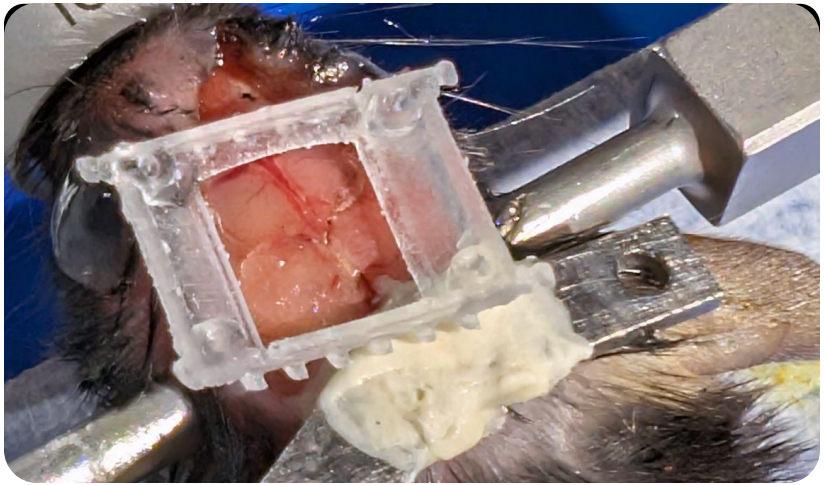
Base Plate Installation

Position and cement the base plate to the skull.

- **Positioning:** Make sure the craniotomy and expected nano-drive position are well within the edges of the base plate.
- **Cementing:** Cement in place using a fine tip applicator to prevent excess infill of cement.

TIP Controlling cement application with a fine tip prevents accidental spillover into the craniotomy area, preserving clear access for subsequent probe insertion steps.





Surgery Guide - Step 8

INSERT PROBE INTO THE BRAIN

2min 46s

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a **Probe Positioning**

Insert the probe into the brain to rest a short distance above your intended recording target; reach out to our team for additional advice if your target is superficial.

b **Durotomy Repair**

Repair the durotomy using Dura-Gel. Mix the component parts in a 1:1 ratio immediately before use; once in place allow 10 minutes to cure – see Dura-Gel User Guide for more details.



Reference Citation:

For dural repair – see Jackson, N., & Muthuswamy, J. (2008). Artificial dural sealant that allows multiple penetrations of implantable brain probes. *Journal of Neuroscience Methods*, 171(1), 147–152. doi:10.1016/j.jneumeth.2008.02.018

Surgery Guide - Step 9

SECURE nano-DRVE TO SKULL

2min 46s

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a

Cement Application

Apply a small amount of cement to the back and sides of the nano-drive to bond to the skull surface.

TIP A small amount of Vaseline on the nano-drive shuttle, including the underside behind the probe shanks will help ensure dental cement does not prevent drive movement prior to implant.



Surgery Guide - Step 10

ALIGN WALLS TO BASE-PLATE AND SECURE IN PLACE

3m 32s

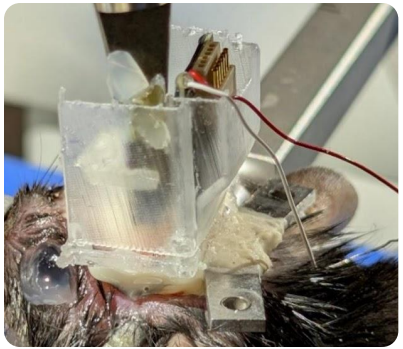
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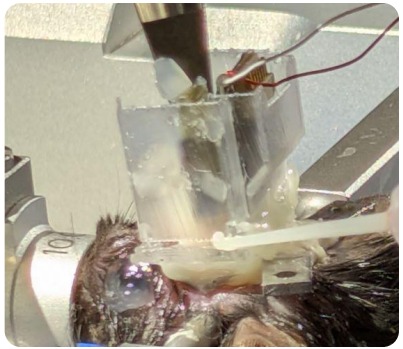
a

Caddy & Headstage Alignment

Bring down the caddy wall with the headstage and seat into the base plate.

i. Reinforce with cement

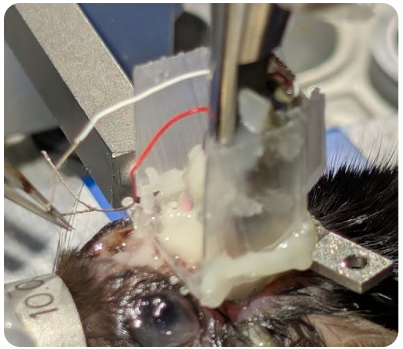




b

Attach GND / REF Wire

Wrap the probe GND / REF wires around the nearby skull screw and reinforce with dental cement.





Surgery Guide - Step 11

ALIGN LID TO WALLS AND SECURE IN PLACE

4min 40s

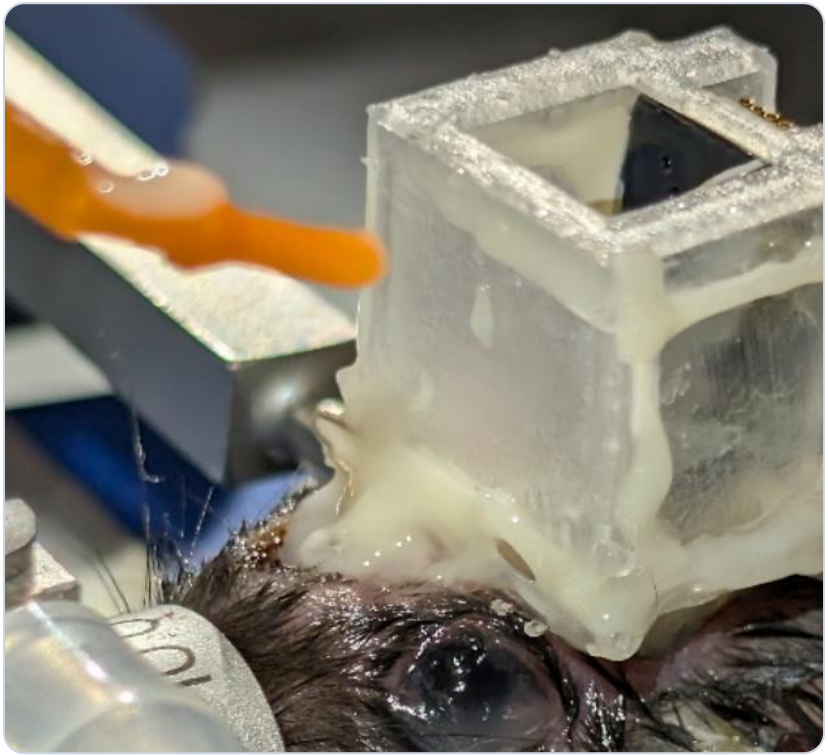
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a. Release the tension on the stereotaxic holder and carefully retract to reveal the nano-drive screw head (the Vaseline applied earlier aids in preventing cement adhesion)

b. Attach the lid of the caddy to the base plate and the top cover to the back and side walls and cement in place

c. Clean the wound and repair soft-tissue

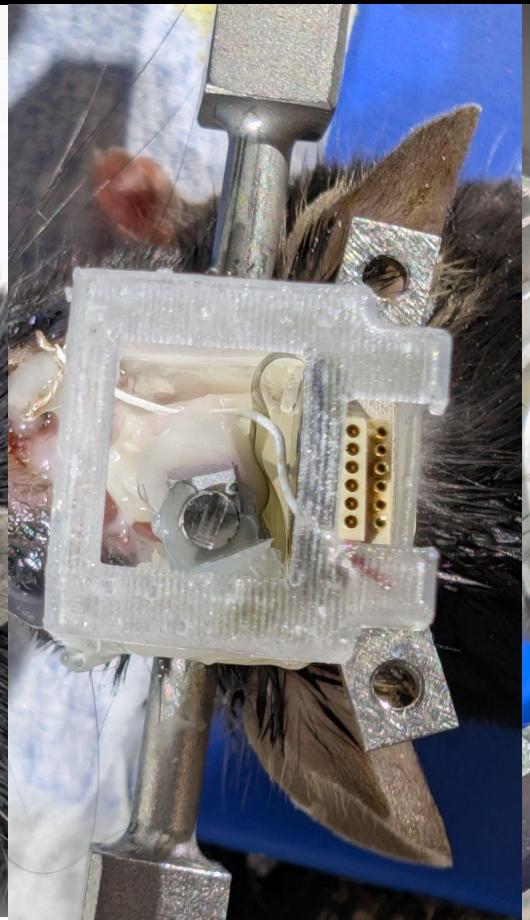
d. Start gathering data!



Surgery Guide - The Finished Implant

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