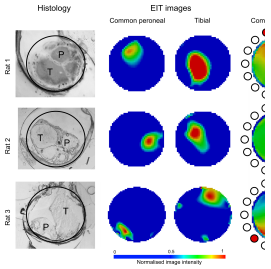
Jan 11, 2019

EIT data aquisition in rat sciatic nerve using stimulation of tibial and peroneal branches



In 1 collection

DOI
dx.doi.org/10.17504/protocols.io.ww7ffhn

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OPEN ACCESS

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External link: http://iopscience.iop.org/article/10.1088/1741-2552/aad78e/pdf

Protocol Citation: Kirill Aristovich, Matteo Donega, David Holder 2019. EIT data aquisition in rat sciatic nerve using stimulation of tibial and peroneal branches. **protocols.io https://dx.doi.org/10.17504/protocols.io.ww7ffhn**

Manuscript citation:
Kirill Aristovich et al 2018 J. Neural Eng. 15 056025

Protocol status: In development
We are still developing and optimizing this protocol

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Protocol Integer ID: 19135

Keywords: imaging, neural traffic, EIT, electroseuticals, cuff electrode, eit imaging dataset, eit data aquisition in rat, sciatic nerve, eit data aquisition, imaging

Abstract

High-level protocol to obtain the EIT imaging dataset and reconstruct images for the paper.

Guidelines

Please consult UCL EIT team before attempting the protocol, the complexity of the required hardware and software is such, that the collaboration will be much more effective. It is possible to create customised easy-to-operate systems and software packages which are tailoried for the specific paradigm

Troubleshooting

Safety warnings

Chemicals used during the electrode interface construction are toxic.

Before start

consult UCL EIT team before attempting the protocol

Hardware

1 Prepare nessesary hardware:

Equipment

UCL EIT system	NAME
EIT system	TYPE
Custom	BRAND
n/a	SKU
https://github.com/EIT-team/ScouseTom	LINK
Number of channels: up to 256 Current frequency range: DC - 20kHz Sampling frequency: 100kHz Onboard stimulator	SPECIFICATIONS

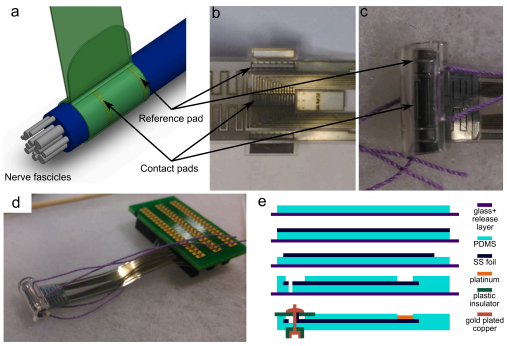
Neural Interface

2 Prepare neural interface:
Follow the instructions in teh paper http://iopscience.iop.org/article/10.1088/1741-2552/aae868

Safety information

Some of the chemical components are toxic
Chemical hood cabinet is required

Expected result



Software

3

Software

UCL EIT system	NAME
UCL EIT group	DEVELOPER
https://github.com/EIT-team/ScouseTom/tree/master/src	SOURCE LINK

Animal Preparation

4 Procedures were performed on a vibration isolated table (Thorlabs Inc., USA) and, throughout experiments, the core body temperature of the rat was controlled with a homeothermic heating unit (Harvard Apparatus, Kent, UK) and maintained at 37ºC

Animal Preparation

5 Sprague-Dawley adult male rats weighing 300 to 450g.

6 Anaesthesia is induced with a 5% isoflurane in 100% O2.

7 ntubated using a small animal laryngoscope

Equipment

Small animal laryngoscope	NAME
Laryngoscope	TYPE
Custom 3D printed	BRAND
n/a	SKU
https://www.thingiverse.com/thing:148315	LINK

8 18G cannula and mechanical ventilation is provided, using a Harvard Apparatus Inspira Ventilator (Harvard Apparatus, Ltd, UK), with a 50/50% gas mixture of O2 and air.

9 Arterial and venous access was established through cannulation (BD Insyte/Vialon, Becton, Dickinson U.K. Ltd.) of the right femoral vessels.

10 The arterial blood pressure should is monitored (Cardiocap 5, Datex Ohmeda) and the mean arterial pressure (MAP) kept between 90 and 110mmHg using labetalol and adrenaline as necessary.

11 Once intravenous access had been established, a constant infusion of propofol is initiated. Monitor the depth with pinch reflex.

Surgery

12 Acess sciatic trunc, common peroneal nerve and tibial nerve following the guide: https://onlinelibrary.wiley.com/doi/full/10.1002/mus.21652

Note

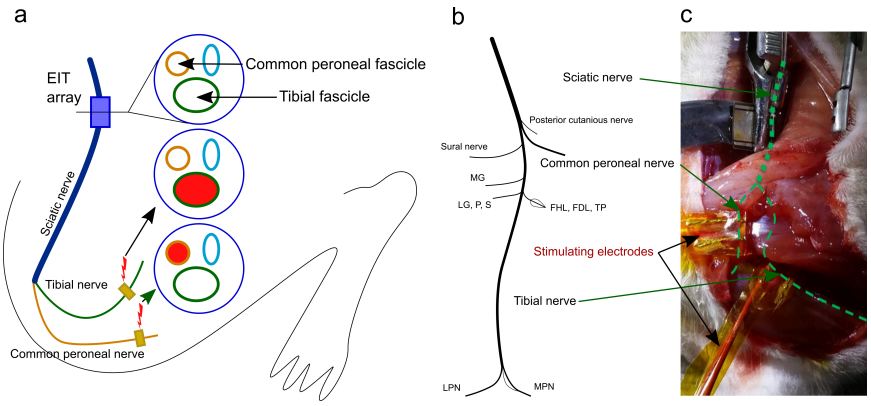
Access to the common peroneal nerve was established through a 2mm lateral incision in biceps femoris near the knee joint.

Electrode placement

13 Implant the stimulation electrodes on common peroneal and tibial branches (bipolar Ag hook electrodes)

14 Implant the EIT array on main sciatic trunc

Expected result



Experimental design and setup. (a) The EIT array was placed on the main sciatic nerve running in the posterior compartment of the thigh approximately 20 mm distal to the greater sciatic foramen. (b-c) Two stimulating electrode pairs were placed on the tibial and common peroneal nerves. EIT images were recorded during the repeated activity in the sciatic nerve evoked with 5Hz stimulation of each branch at a time.

Data aquisition

15 For all studies, a square biphasic (positive first) constant current temporal waveform was delivered using a balanced current source (Keithley, UK model no 6221) with:
1-3 mA amplitude,
50 µs pulse width,
5Hz frequency (200 ms inter-stimulus time)

16 Program the EIT system with the following paerameters:
EIT_parameters.mat

17 Connect stimulator to the tibial stimulation electrode. Collect the data

18 Connect stimulator to the common peroneal stimulation electrode. Collect the data

Data Processing and Image reconstruction

19 Load and process the data using the following software:

Software	
UCL LoadData	NAME
UCL EIT team	DEVELOPER
https://github.com/EIT-team/Load_data	SOURCE LINK

20 Forward solution

Software

NAME	DEVELOPER	SOURCE LINK
PEITS	UCL EIT team	https://github.com/EIT-team/PEITS

21 Inverse solution and images generation

Software

NAME	DEVELOPER	SOURCE LINK
Image Reconstruction	UCL EIT team	https://github.com/EIT-team/Reconstruction