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UC Davis - Dynamic contrast enhanced magnetic resonance imaging

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Protocol status: Working

We use this protocol and it's working

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Abstract

Summary:

Dynamic contrast enhanced magnetic resonance imaging (DCE-MRI) is used to assess blood-brain barrier permeability in vivo in rodent models. Post-processing image analysis is done using our in-house matlab script with patlak linearized regression mathematical modeling.

Materials

Reagents and Materials:

- Magnevist
- Sterile Saline (0.9% NaCl)
- Ketamine
- Xylazine
- 1cc syringe

Safety warnings

! WARNING HAZARDOUS CONDITION WARNED AGAINST. All personnel must have had gone through MRI safety training.

1 **Animal Preparation:**

1. Prior to DCE-MRI, the animal should have been through the Femoral Vein Cannulation protocol.

2 **Setting Up the Microgradients and Animal stage:**

1. Transport the mice to the NMR facility
2. Turn off main power source to the 7T and the water circulator.
3. Disconnect the power cables and water circulator from the standard gradient to the 7T.
4. Carefully carry the microgradient to the 7T and insert into the bore. (The microgradient weighs about 40 pounds!)
5. Connect the power cables and water circulator from the microgradient to the 7T. Make sure the isocenter of the microgradient is in the proper place using the ruler measurement. (Distance will be posted at the front of the bore).
6. Turn main power and water circulator back on.
7. Connect the proper tubing for the circulating water heater to keep animal temperature. Make sure distilled water is filled passed the indicated mark. Thread the tubing through the animal stage and tape it in place.
8. Place the animal stage on the 7T stage and tape that into place. Turn on the water heater to warmup.

3 **Setting Up the Animal in the 7T**

1. Place the animal in the supine position at the tip of the animal stage. Insert the bite bar into the mouth of the animal.
2. Make sure the head is straight and taught from the body. Tape the bite bar and head in place. Place the circulating water heater on the abdomen of the animal.
3. Insert the animal into the microgradient making sure that the stage does not touch the microgradient. Make sure no limbs and tail of the animal is hanging out.
4. The tubing from the cannula should be long enough to come out of the bore and is still accessible to the person.

5. The head of the animal should be at the isocenter of the microgradient.

4 **Setting Up the computer**

1. Open the Paravision 5 program.

2. Click on file > new > set-up information for your subject.

3. Click on the wrench icon to open the "Tools" window.

4. Load protocol from the "Anderson" file folder.

5. Know your imaging parameters beforehand (i.e voxel size 32mmx32mmx1mm) to ensure all images have the same parameters and make adjustments prior to running the protocol.

6. Run Protocol 1 = One Pulse

7. Run Protocol 2 = RARE_VTR Tripilot

a. Using the measurement tool, make sure that the sulcus of the brain is 5mm from the isocenter. Make any adjustments necessary to ensure the animal is in the proper place.

8. Repeat step 6 until animal is in proper place

9. Run Protocol 3 = MSME

10. Run Protocol 4 = Perfpack060314

11. Run Protocol 5 = RARE_VTR_micro

12. Set-up macro:

a. Click on the black hat to open the "macro" screen

b. Scroll until you find the Scan N protocol (make sure N=10)

c. Clone Protocol 5 ten times

d. Make sure mouse cursor is at the first scan (scan 6)

e. Run Macro

13. The baseline measurement will automatically begin

14. A syringe with Magnevist (diluted or undiluted in saline depending on the weight of your animal to be able to measure the proper amount you can accurately infuse into the animal) should be hooked up to the cannula. The Magnevist concentration should be injected at 0.5ml/kg.



15. Once the baseline measurement is at 80%, count 8 "clicks" and then start the infusion follow by a flush of saline at the same volume.
16. Let the macro run its course.
17. Run protocol 17 = MSME
18. Run protocol 18 = Perfpack060314
19. All data will be saved onto the hard drive.
20. Upload data onto the Kona server to ensure that the data is safely stored.