Multicenter, Phase II Assessment of Tumor Hypoxia in Glioblastoma Using $^{18}$F-Fluoromisonidazole (FMISO)
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ACRIN 6684 Study Schema

Sample Size and Eligibility
A total of 50 participants will be enrolled. The first 15 participants will have test/retest FMISO PET scans at baseline performed between 1 and 7 days apart (both scans completed prior to initiation of chemoradiation).

Please note: Participants must have a visible enhancing tumor with at least a 4cc of tissue volume to be eligible for trial

Primary Objective
To determine the association of baseline FMISO PET uptake (hypoxic volume [HV], highest tumor:blood ratio [T/Bmax]) and MRI parameters (Ktrans, CBV) with overall survival (OS) in participants with newly diagnosed GBM.

Secondary Aims
Aim 1: To determine the association of baseline FMISO PET uptake (HV,T/Bmax) and MRI parameters (Ktrans, CBV) with time to progression (TTP) and 6-month progression free survival (PFS-6) in participants with newly diagnosed GBM.

Aim 2: To determine whether change on FMISO PET uptake and MRI parameters from baseline to week 4 is associated with OS, TTP, and PFS-6 in participants with newly diagnosed GBM.

Aim 3: To determine whether change on FMISO PET uptake and MRI parameters from baseline to week 10 is associated with OS, TTP, and PFS-6 in participants with newly diagnosed GBM.

Aim 4: To assess the reproducibility of the baseline FMISO PET uptake parameters by implementing baseline “test” and “retest” PET scans (performed within 1 to 7 days of each other).

Aim 5: To assess the correlation between highest tissue:cerebellum ratio [T/Cmax] and T/Bmax at baseline, week 4, and week 10.

Aim 6: To assess the correlation between other MRI parameters (T1Gd, VCI, CBV-S, ADC, NAA-Cho, T2) and OS, TTP and PFS-6.
Dear MR Imaging Staff,

The MR Imaging Manual (MIM) contains MR image acquisition instructions for the ACRIN 6684 trial: *A Multicenter, Phase II Assessment of Tumor Hypoxia in Glioblastoma Using \(^{18}\)F-Fluoromisonidazole (FMISO) With PET and MRI*.

For the study objectives to be successfully met, it is critical that you acquire the MR images according to the imaging protocol detailed in this manual. Because the MRI protocol required for this study may be new for your site, and this may be your first time supporting an ACRIN clinical trial, an onsite visit to review the imaging parameters will be conducted by core laboratory MRI technologist Kesha Smith to ensure you are ready to confidently scan your first study participant.

During the site visit, Kesha will also review the mandatory forms to be completed at the time of each MRI scan acquisition as well as the instructions included in the manual for submitting images to the core laboratory at ACRIN headquarters in Philadelphia, PA.

Part of ACRIN standard procedures is a quality control (QC) review of the images sent to the core laboratory. Should a core laboratory technologist performing the QC review identify any protocol violations or technical issues, he or she will provide expedient feedback so that you can make the necessary adjustments. Upon successful QC review, the images will be transferred to a third-party independent core laboratory for specialized analysis.

Thank you in advance for your diligent efforts in adhering to the procedures described in this manual and for helping us ensure the compliance and integrity of the image data collected for the ACRIN 6684 study. We look forward to collaborating with you!

Sincerely,

*The ACRIN MR Imaging Team*

Kesha Smith, RT (R) (MR) (M) – 215-940-8810 ksmith@acr-arrs.org
Lisa Cimino, RT (R) (MR) - 215-574-3243 lcimino-c@acr-arrs.org
MRI Scanner Qualification Procedures

Qualification Requirements Overview
To participate in the ACRIN 6684 trial, a site must perform and submit to the imaging core laboratory test qualifying MRI and MRS scans as described in the protocol. The test scans must be performed on a volunteer taking into consideration your site’s institutional review board requirements. Please note: administration of contrast is not necessary for the test scans.

Qualification of MRI and MRS scans must be performed and submitted to ACRIN for each scanner to be used in the ACRIN 6684 trial. Please note: a study participant must be scanned on the same ACRIN-qualified scanner from time point to time point. A detailed vendor specific parameter chart is posted on the ACRIN 6684 Web site at www.acrin.org/6684_protocol.aspx Click on “Imaging Materials”.

Image Qualification Review
Test scans will be reviewed to ensure they are protocol compliant, and the site research associate and lead technologist will receive an e-mail regarding the review results. If the test MRI and MRS scans are approved, a certificate will be included in the e-mail documenting the approved scanner’s type, model, and station name. If the scans are not approved, a form that explains required corrections will be e-mailed. Please note: approval of the test images is mandatory prior to a site registering a participant onto the trial.

MRS Test Case Submission
Raw spectra data and screen capture showing voxel placement must be e-mailed to ACRIN via SFTP client: ftp://xray.acrin.org. Contact the ACRIN core laboratory at 215-940-8810 to obtain a login and password for submitting these data.

Please refer to the vendor-specific Spectroscopy PowerPoint presentations for locating the .rda file (Siemens), .spar/.sdat file (Philips), and .P-file (GE) located at: www.acrin.org/6684_protocol.aspx Click on “Imaging Materials”.

MRI Test Case Submission
The required MRI test cases must be in DICOM format only. Please affix a label to the media (CD, DVD) jacket that includes: study name, site name, site number, scanner make and model. Do not apply adhesive labels directly to the CD. Mail the MRI images to:

American College of Radiology Imaging Network
MRI/CT Core Laboratory
Attn: ACRIN 6684
1818 Market Street, 16th floor
Philadelphia, PA 19103

Any questions please do not hesitate to contact the MRI Imaging Team;
Kesha Smith, RT (R)(MR)(M) – 215-940-8810  ksmith@acr-arrs.org
Lisa Cimino, RT (R) (MR) - 215-574-3243  licimino-c@acr-arrs.org
MR Image Acquisition Parameters

All MRI scans must be completed on a 1.5 or 3.0 Tesla scanner, and 3.0 Tesla is preferred. To ensure the reproducibility of images, sites MUST scan study participants on the same ACRIN-approved MRI scanner for which trial qualification scans were performed and using the same protocol-specific parameters consistently at each time point.

The following MRI and MRS sequences are mandatory across all scanner models for each study participant:

- Scout;
- T1 – weighted SE (pre injection);
- 3D T2 Rare;
- FLAIR;
- Blood Oxygen Level Dependent (BOLD) Imaging
- T1 mapping;
- Dynamic contrast enhanced images;
- Diffusion – weighted imaging;
- Dynamic susceptibility contrast imaging;
- Post T1 3D – weighted (1 mm isotropic);
- Post T1 – weighted SE;
- 3D Volumetric Spectroscopy is preferred. 2D CSI Spectroscopy is accepted

Spectroscopy power point presentation located on the ACRIN website

Please note: Vendor-specific imaging technique charts are available on the ACRIN Web site at: www.acrin.org/6684_protocol.aspx (click on “Imaging Materials”). Please print the appropriate chart and have it available for review when performing the scan.
MR Imaging Procedures for Advanced Imaging

Choose slice locations for the advanced imaging sequences (DCE, DSC, BOLD and MRS) so that the same volume of tissue is imaged for each sequence. For DCE, DSC and BOLD sequences, be sure as much as possible that the same slice locations are imaged.

BOLD Imaging Protocol

The oxygen breathing procedure described below is to be performed the BOLD imaging sequence:

1. Room air for 8 minutes
2. 100% FiO2 hyperoxia for 4 minutes
3. Room air for 2 minutes

A 0-75 L/min high precision flow meter is to be attached to the oxygen wall outlet, to deliver oxygen at flow rates of 40 to 45 L/min. Wide-bore plastic tubing must be used to minimize gas draft with a simple face mask.

Dynamic Contrast-Enhanced (DCE)- MRI Protocol

Description
The DCE-MRI consists of 5 short series used for T1 mapping, followed by the dynamic MRI series. The dynamic series is a “multiphase” technique with images acquired before, during, and after intravenous injection of gadolinium (Gad)-based contrast agent.

Platform/scheduling
Patients must be imaged on the same scanner for all MRI studies.

General technique

- Prescan calibration should be completed prior to the T1 mapping series and should not be repeated until after the dynamic series is completed (if needed).
- The slice locations and positioning for the T1 mapping and the dynamic series should be identical.
- For all series, do not use normalization filters such as SCIC or PURE.
- If magnets and multichannel head coils are available to perform parallel imaging, speed factors for ASSET or IPAT of 2 can be used. Do not use higher speed factors.
- If parallel imaging techniques are used, identical parallel imaging techniques must be used on all series.
- If parallel imaging techniques are not available, sites can use zero-filled interpolation in the phase and frequency direction “Zip x 2.”
- Images should be acquired as axial; do not acquire as oblique.
3 to 5 mm slice thickness - yielding a 6 cm slab of effective coverage.

A contrast agent power injector should be used for contrast administration in this study. The power injector should be set up per standard protocol.

Enough contrast agent should be loaded for both the DCE scan and the additional contrast agent used for the DSC-MRI sequence.

The rate of injection should be 3 to 5 cc/sec, followed by a saline flush at the same rate.

**T1 mapping series technique**

- The repetition time (TR) must be identical for all flip angles.
- The lowest flip angle should be 2 degrees. ACRIN can provide source code to compile to run this sequence, if needed.

**For the baseline study**

- If prior studies are available, center the slice locations (in the z-direction) for T1 mapping series on the area with the largest enhancing abnormality.
- If no prior studies are available, center slice locations on the area with largest abnormality on T2-weighted images.
  - Note that if the largest abnormality is near the top or bottom of the brain, it is acceptable for the highest or lowest slice locations (respectively) to be outside of the brain or outside of coil coverage.

**For subsequent studies**

- Center the slice locations for mapping sequence to match those of the baseline study.

**Dynamic series technique**

- Allowable contrast agents are: Magnevist, Omniscan, Dotarem, ProHance, and Gadovist. Please do not use MultiHance.
- The contrast agent should be administered using a power injector. Patients will require a heparin lock or other similar device for the administration of contrast agent during the dynamic sequence with the patient in the scanner.
- The frame rate of the multiphase acquisition should be acquired in 6 seconds or less such that each volume should be completely sampled every six seconds or more frequently, if possible.
- Injection takes place after 10 baseline frames are obtained.
- The total imaging time should be 5.5 minutes. This amounts to 55 to 95 frames, depending upon the acquisition time. The total number of slices acquired should be 660 to 1,900, depending on the number of slices in each frame.
- Contrast agent administration is 0.1 mmol/kg via power injector (3 to 5 cc/sec), followed by a flush with 20 cc of normal saline at the same rate.
Dynamic Susceptibility Contrast (DSC)- MRI Protocol

Description
The DSC-MRI protocol consists of administering a preload of a Gad (the Gad used for the DCE exam), followed by the collection of echo planar imaging (EPI) data before, during, and after administration of an additional bolus of Gad contrast agent. The DSC acquisition is started 5 to 10 min after the DCE acquisition.

General technique
- The EPI sequence should be set up to collect at least 120 points with a TR between 1.0 and 1.5 seconds. A GRE-EPI, SE-EPI, or a simultaneous GRE/SE-EPI sequence can be used:
  - For GRE-EPI, echo time (TE) should equal 30 to 40 milliseconds.
  - For SE-EPI, TE should equal 70 to 105 milliseconds.
  - If using a combined GRE/SE-EPI sequence, use the minimum TE for SE, which will likely be slightly longer than the 70 to 105 milliseconds range listed above.

Specific DSC-MRI acquisition

1. Start the DSC-MRI sequence. After collecting at least 60 (35 minimum) baseline points, inject the bolus of contrast agent (0.1 mmol/kg). Continue collecting the data so that at least 120 points are collected per slice.

Examples of the DSC-MR images collected and time course from a single voxel are shown below in Figure 1. Note the transient darkening of the image and the decrease in signal as the contrast agent passes through the tissue.

![Figure 1. Example images and signal time course collected during a DSC study](image)

Shown are GRE-EPI images collected at three different time points, before, during and after the bolus injection of contrast agent, along with an example signal time course from one voxel. Notice that the
image and voxel signal intensity transiently decrease as the bolus of contrast passes through the tissue.

**MRI Collection Time Points/Visits**

All patients will undergo baseline $^{18}$F-FMISO PET and MRI studies 2 to 4 weeks after initial debulking surgery and prior to radiotherapy (XRT) (T0). Additionally, imaging will be performed after 3 weeks of radiotherapy (T1) and 4 weeks after the radiation is complete, before the second cycle of temozolomide (TMZ) (T2).

**Important Note:** Please work with the RA and persons responsible for scheduling the PET and MRI scans to accommodate study participants’ preference for either undergoing the MRI and PET scans on the same day OR for scheduling the scans on separate days, but not longer than 2 days apart per the protocol.

<table>
<thead>
<tr>
<th>Table 1. TREATMENT AND IMAGING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visit 2</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>TMZ (mg/m$^2$/day)</td>
</tr>
<tr>
<td>Radiation Therapy</td>
</tr>
<tr>
<td>FMISO PET Scan$^\dagger$</td>
</tr>
<tr>
<td>Brain MRI Scan With Contrast$^\ddagger$</td>
</tr>
</tbody>
</table>

$^\dagger$The first 15 participants will have two baseline $^{18}$F-fluoromisonisazole (FMISO) PET scans performed 1 to 7 days apart for test/retest analysis (see protocol section 9.2.1 for details of visit 2A); both scans must be completed prior to initiation of chemoradiation.

$^\ddagger$All MRIs (with or without contrast) and CTs performed as standard of care during participant follow up should be submitted to ACRIN (see protocol section 10.4, “Image Submission Criteria,” for details).
Image Submission Requirements and Options

Following are instructions for submitting the two types of MR scans required at each time point in this protocol:

**Raw MRS Data Files Submission Instructions**

Raw spectra data and screen capture showing voxel placement must be e-mailed to ACRIN via SFTP client: [ftp://xray.acrin.org](ftp://xray.acrin.org). Contact the ACRIN core laboratory at 215-940-8810 to obtain a login and password for submitting these data.

Please refer to the vendor-specific PowerPoint presentations for locating the .rda file (Siemens), .spar/.sdat file (Philips), and .P-file (GE) located at: www.acrin.org/6684_protocol.aspx (click on “Imaging Materials”).

Raw spectra data files must be named according to the labeling convention: Institution_Subject ID_Time point. Examples include the following:

- If your institution number is 04 and you are scanning subject 007 at baseline, your file would be named:
  04007_baseline.rda or 04007_baseline.spar

- If subject 7 is returning for the week 26 time point, the file would be named:
  04007_week26.rda or 04007_week26.spar

Upon submitting spectra and screen data capture, fax the Image Transmittal Worksheet (see “Image Transmittal Worksheet Instructions”) to the ACRIN core laboratory at 215-923-1737.

Please call the ACRIN core laboratory at 215-940-8810 with questions.
MR Image Submission Instructions

Sites have two options for submitting MR images to ACRIN’s image archive:
- Using ACRIN’s image transfer application (TRIAD)
- Express mailing images on a CD-ROM

Important Note: All MR images for this protocol must be provided in DICOM format.

TRIAD software for SFTP submission

The preferred image transfer method is via TRIAD, a software application that ACRIN provides for installation on a site’s PC. TRIAD collects image sets from a scanner’s computer or from the picture archiving communications system (PACS). The TRIAD software anonymizes, encrypts, and nondestructively compresses the images as they are transferred to the ACRIN image archive in Philadelphia. Once equipment-readiness has been determined, imaging personnel from ACRIN will coordinate installation and training for the software. For more information, contact: TRIAD-support@phila.acr.org or call 215-940-8820.

Upon electronically submitting the MR images, sites should fax the Image Transmittal Worksheet (see “Image Transmittal Worksheet Instructions”) to the ACRIN core laboratory at 215-923-1737 or e-mail it to ksmith@acr-arrs.org.

Media delivery instructions

For exams submitted via a CD-ROM, please affix a label to the CD jacket that includes: study name, site name, site number, subject number, date of scan(s), image time point, and type of imaging. Do not apply adhesive labels directly to the CD.

Complete the Image Transmittal Worksheet (see “Image Transmittal Worksheet Instructions”) and include with the media shipment.

Mail the images and worksheet to:

American College of Radiology Imaging Network
MRI/CT Core Laboratory
Attn: ACRIN 6684
1818 Market Street, 16th floor
Philadelphia, PA 19103
Image Transmittal Worksheet Instructions

The Image Transmittal Worksheet (ITW) on the following page can also be found on the protocol-specific page of the ACRIN Web site: www.acrin.org/6684_protocol.aspx (click on “Imaging Materials”).

MRI and MRS images are required to be submitted to ACRIN after each time point (or visit) that must be recorded on the ITW. A separate ITW must be completed for the MRI and MRS submission.

The ITW must include the site number/subject number, as well as the name of the technologist performing the scan. Other information required on this form includes the time point, date of study, participant date of birth (for quality control purposes), and mode of image submission (submission via TRIAD is preferred).

Sites must also provide the e-mail address of the person who should receive feedback regarding image quality. An ACRIN core laboratory imaging specialist reviews the ITW in order to confirm the number of series, number of images, and the appropriate identifying/de-identified information for the imaging study.

**Important Note:** This form MUST be completed in its entirety. No image submissions will be credited as being received without a fully completed ITW.
ALL FIELDS ARE REQUIRED. PLEASE COMPLETE THIS FORM CAREFULLY.

MR Images:
Imaging exams must be submitted to the core laboratory after each time-point/visit along with a completed, signed Image Transmittal Worksheet. Please keep a copy for your records.
- For images submitted via TRIAD, complete this worksheet and fax it to: 215-923-1737, or e-mail to ksmith@acr-arrs.org.
- For images submitted via a mailed CD, complete this worksheet and include with the media shipment. Please affix a label to the jacket of the media to include: study name, site name and number, case no, date of exam(s), time point, and type of imaging. **Do not affix labels directly to the CD.**

MR Spectroscopic Raw Data:
- Raw spectral files will be submitted to ACRIN via an ftp site. ACRIN will provide each site with a unique address, login and password for submission of raw MR Spectroscopy data. A screen capture demonstrating appropriate voxel placement must also be submitted in .jpeg or .bmp format with the raw file via ftp.

For further information, questions or ftp login info, contact the ACRIN imaging staff @ 215-940-8810.

### Section I: Image Data Demographics

<table>
<thead>
<tr>
<th>Site Number:</th>
<th>Case Number:</th>
<th>Scanner Strength: 1.5T 3.0T</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient DOB:</th>
<th>Study Date</th>
<th>Participant Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-19</td>
<td>1-20</td>
<td>First M Last</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Timepoint:</th>
<th>Images from an ACRIN Approved Scanner?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Yes ☐ No ☐ Record scanner model and station:</td>
</tr>
<tr>
<td>Visit 3 (scan 2)</td>
<td>☐</td>
</tr>
<tr>
<td>Visit 4 (scan 3)</td>
<td>☐</td>
</tr>
<tr>
<td>Follow up/Final</td>
<td>☐</td>
</tr>
</tbody>
</table>

### Section II: Data being submitted - **SELECT ONLY ONE** of the following descriptions per form:

☐ MRS Raw File and screen capture of voxel placement have been sent electronically

**OR**

☐ MR Images CD-ROM are accompanying this form via shipment

Institution Comments:

Form Completed By: | Phone: | Email: | Date:
|-----------------|--------|--------|-------|
ACRIN imaging specialists review all ITWs and images submitted to ensure images comply with the protocol parameters. Should the specialist discover that images or image-related data are missing, inaccurate, or inconsistent with the imaging protocol, sites are notified through the following process:

1. An imaging query describing the problem is e-mailed to the study coordinator. Such a query is also referred to as a Z5 form (see example below).

2. The site should resolve the problem as quickly as possible and must maintain a hard copy of the completed and signed query at the site.

3. A site receives up to three reminders to resolve a query. After that time, an outstanding query is reported to the trial leadership for assistance with resolution.

[Image of Z5 form]

**Quality Control Procedures**

**DATE of this request**

**TO:**

**Cases:**

**FROM:** Core Lab

**Subject: Imaging Query**

**Inst. Name:**

**Study No./Name:** ACRIN 6684

The above mentioned care from your institution is immediately required. Kindly supply the missing images and/or subject information described in the Site Response section to make them available for final review. Please print and sign this form and return to Project Osservatori, CSON, BE (NJ) via FAX to (212) 933-1777 as soon as possible.

**Z5 Form**

**Imaging Query**

**Request for Additional Imaging Information**

<table>
<thead>
<tr>
<th>X</th>
<th>Image Type</th>
<th>Study Date</th>
<th>Explanation</th>
<th>Site Response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Missing Images/Views - Study incomplete (<strong>Site Comments</strong>).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Date of Birth (DOB) on Images does not match DOB in Clinical DB; Please confirm correct DOB (Site Comments).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anatomy Not Covered (ANC) (<strong>Site Comments</strong>).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor Quality Images (<strong>Site Comments</strong>).</td>
<td></td>
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<tr>
<td></td>
<td>Incorrect Case # assigned to image (<strong>Site Comments</strong>).</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Incorrect technical aspects utilized (<strong>Site Comments</strong>).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OTHER (<strong>Site Comments</strong>).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ACRIN Comments:**

**SITE Comments:**

**Institution Representative:**

**Phone No.:**

**Email:**

**Signature:**

**Date:**
Part I. MR Visit
1. Time point: ○ Visit 2 (baseline imaging) ○ Visit 3 (scan 2) ○ Visit 4 (scan 3)
2. Imaging completed? ○ Yes, Date of Imaging: _______ - _______ mm-dd-yyyy ○ No, Reason:
   ○ Equipment failure ○ Patient refusal ○ Medical contraindication ○ Injection site complications ○ Claustrophobia ○ Other, specify __________________________________________

Part II. Steroid use and Renal Function Test
1. Was the participant taking any steroids at the time of the MRI? ○ Yes, complete Q1a ○ No, skip to Part III
   1a. If yes, provide details below:
      | Steroid Name | Steroid Dose Per Day | Start Date |
      |--------------|----------------------|------------|
      |              | Dose ________/day    | mm/dd/yyyy |
     2. Did the participant have serum creatinine level within 4 weeks of this imaging visit?
        ○ Yes, Date of labs: _______ - _______ mm-dd-yyyy ○ No
        Serum Creatinine Level:__________________________
     3. Subject weigh (at time of scan): ____ ____ ____ • ____kg

Part III. Scanner
1. What magnet strength was the exam acquired on? ○ 1.5 Tesla ○ 3.0 Tesla
2. Manufacturer/vendor the exam acquired on? ○ GE ○ Philips ○ Siemens
3. Has the scanner used for this study been qualified by ACRIN? ○ Yes ○ No, Reason:
   ________________________________________________
4. □ Check to confirm scanner is the same scanner used for all previous protocol scans
   If 1st scan, check to confirm scanner will be used for future protocol scan

Part IV. Sequences Acquired
<table>
<thead>
<tr>
<th>Sequence</th>
<th>Performed?</th>
<th>reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 weighted pre-contrast</td>
<td>○ Yes</td>
<td>○ No, reason ○ Equipment failure ○ Other, specify: ○ Claustrophobia</td>
</tr>
<tr>
<td>T2 weighted pre-contrast</td>
<td>○ Yes</td>
<td>○ No, reason ○ Equipment failure ○ Other, specify: ○ Claustrophobia</td>
</tr>
<tr>
<td>FLAIR</td>
<td>○ Yes</td>
<td>○ No, reason ○ Equipment failure ○ Other, specify: ○ Claustrophobia</td>
</tr>
<tr>
<td>BOLD</td>
<td>○ Yes, Provide: Initial room air mean O₂ saturation ____ ____ • ____% ○ No, reason ○ Equipment failure ○ Other, specify: ○ Claustrophobia ○ Unknown</td>
<td></td>
</tr>
</tbody>
</table>

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### T1 Mapping

<table>
<thead>
<tr>
<th>T1 Mapping</th>
<th>O2 flow rate _______ L/min</th>
<th>Mean O2 saturation during hyperoxia _______ %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○ Other, specify;</td>
<td>○ Unknown</td>
</tr>
<tr>
<td>○ Yes</td>
<td>○ No, reason ○ Equipment failure ○ Other, specify:</td>
<td>○ Unknown</td>
</tr>
</tbody>
</table>

1. **Was contrast given?** ○ Yes, Dose _______ mL ○ No

   **Rate of Injection:** _______ cc/sec  
   **Contrast Brand:** ○ Magnevist ○ Optimark ○ ProHance ○ Omniscan ○ Dotarem ○ Other, specify: ______________________________

2. **Was 2\(^{nd}\) injection performed?** ○ Yes, Dose _______ mL ○ No  
   **Rate of Injection:** _______ cc/sec

3. **Were any AE's reported?** ○ Yes, record and report AE per protocol ○ No

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**Initials of Technologist**  
**Initials of Person(s) Completing This Form**  
**Date Form Completed mm-dd-yyyy**