Alzheimer's Disease Neuro Imaging III (ADNI3) Study

3T MRI Technical Procedures Manual

Contents

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1. CONTACT INFORMATION FOR THE ADNI3 STUDY

If you have any questions or concerns regarding MRI imaging, please contact the Mayo Clinic Aging and Dementia Imaging Research (ADIR) Laboratory:

ADNIMRI@mayo.edu

If you have any questions regarding the scan uploading to LONI, please contact:

dba@loni.usc.edu

2. BACKGROUND AND SIGNFICANCE OF THE ADNI3 STUDY

Since its launch in 2004, the overarching aim of the Alzheimer's Disease Neuroimaging Initiative (ADNI) has been realized in informing the design of therapeutic trials in AD. ADNI3 continues the previously funded ADNI1, ADNI-GO, and ADNI2 studies that have been combined public/private collaborations between academia and industry to determine the relationships between the clinical, cognitive, imaging, genetic and biochemical biomarker characteristics of the entire spectrum of Alzheimer's disease (AD).

Our strategy is based on the concept that the AD process is characterized by the accumulation of Aβ and phosphorylated tau, synaptic loss and neurodegeneration, leading to cognitive decline. Clinical/cognitive measures lack both sensitivity and specificity to detect AD pathology. Instead, biomarkers are more reliably used to identify participants at risk for cognitive decline and to measure disease progression. This project will collect MRI (structural, diffusion weighted imaging, perfusion, and resting state sequences); amyloid PET using florbetapir F18 (florbetapir) or florbetaben F18 (florbetaben); ^{18}F-FDG-PET (FDG-PET); CSF for Aβ, tau, phosphorylated tau (AKA phosphotau), and other proteins; AV-1451 PET; and genetic and autopsy data to determine the relationship of these biomarkers to baseline clinical status and cognitive decline.

3. SITE QUALIFICATION

3.1. Overview

Prior to any ADNI3 subjects being scanned at a particular site, that site must complete ADNI3 MRI Site Qualification. Initial site qualification will require human and phantom scans. Subsequent qualification (after upgrades) may require only a phantom scan. The electronic ADNI3 sequences which will be provided by Mayo Clinic ADIR and loaded by your local service engineer or lead technologist.

Once received, Mayo Clinic ADIR QC Team will review the phantom and human scans for correct parameters, good image quality and scanner performance. If either scan does not pass Mayo Clinic ADIR QC, your site will be asked to re-scan after making the suggested changes by the Mayo Clinic ADIR QC team.

NOTE: Only one MRI scanner is qualified for the ADNI3 study at your site and must be used for ALL subsequent subject scans during the study. If the same MRI scanner is not used, the

scan will not be reimbursed, and the subject will need to be re-scanned on the ADNI3 qualified scanner.

3.2. Phantom Quality Control Scan Protocol

1. Localizer
2. QC Phantom Sagittal 3D Accelerated MPRAGE/IRSPGR

3.3. Human Scan Protocol

- No adjustments should be made to these protocols
- There are two sections to the human protocol – Core and Optional

3.3.1. Human CORE Scan Protocol

1. 3 Plane/Tri-Planar Scout/Calibration Scan
2. Sagittal 3D Accelerated MPRAGE/IRSPGR
3. Sagittal 3D FLAIR
4. Axial T2 Star/GRE
5. Axial 3D pCASL or Axial 2D PASL
6. Axial DTI
7. Axial Field Mapping Sequence
8. Axial fcMRI (*Subject should have eyes OPEN*)
9. Accelerated High Resolution Hippocampus Scan (Oblique – perpendicular to hippocampal tail)

- After each scanning session, please upload the DICOM images to the LONI ADNI3 Online Data Portal using the ADNI3 naming conventions detailed in Section 3.5 of this manual.

3.4. Phantom Scan Instructions

For site qualification, each site must scan the ADNI phantom or other local phantom using the electronically loaded ADNI3 Phantom QC protocols and ADNI3 Human Scan protocols.

*NOTE: This can be done prior to IRB approval.

3.4.1. Phantom Positioning

The following image shows the ADNI phantom placed in the appropriate position within a multi-channel head coil. Achieving a reproducible phantom placement position is a key element to the system performance analysis that will only be done at initial site certification, software/hardware upgrades, or when significant maintenance is performed. The phantom should be placed in the coil with the alignment markers facing upward and the serial number SN XXXXX positioned as shown, along with alignment guides, this will facilitate the reproducible positioning of your phantom.

Figure 1. ADNI phantom shown positioned inside of an 8-channel head coil.

Please note that your phantom has a base and positioning markers (in black and red, see image below). The phantom should be placed inside the head coil with the indicated "top" facing upwards. Please inspect the phantom and note the additional marks added to help you position your phantom. We have indicated the top of the phantom with red and black marks to aid with placement in the coil.

NOTE: The Mayo Clinic ADIR QC Team will be supplying electronic protocols for installation by your local service engineer, physicist, or lead technologist. This will ensure that you have the correct protocol for your MRI scanner.

NOTE: Use only the imported ADNI3 MRI sequences.

If you have any questions or concerns regarding MRI imaging, please contact:

ADNIMRI@mayo.edu
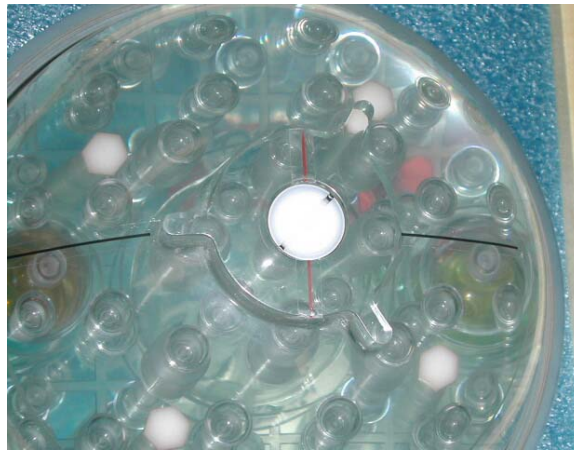
Figure 2. The top of the phantom and the alignment lines are indicated above. These markings should be used with the alignment lights/crosshairs on your scanner to position the phantom.

The top of the phantom and the alignment lines are indicated above. These markings should be used with the alignment lights/crosshairs on your scanner to position the phantom.

Please place the phantom in your head coil with the alignment marks facing up, and the phantom SN number (e.g. 9999) is facing out (Fig. 3). Furthermore, try to align the center of the phantom with the center of the coil. Use the alignment lights/crosshairs on your scanner to position the phantom into the center of the magnet.

Figure 3. The image on the left shows the phantom placed in the correct position, with the Serial Number (SN 9999) facing out. This will be the typical scanning position for your phantom. The image on the right shows a typical sagittal MRI image of the phantom.

For site certification your site will be expected to place the phantom in the head coil as described above and scan BOTH the ADNI3 Phantom Scan Protocol and the Human Scan Protocols which were loaded electronically on your system previously.

*Under no circumstances should a site build these protocols manually.

3.4.2. Phantom Scan Protocol

1. Localizer
2. QC Phantom Sagittal 3D Accelerated MPRAGE/IRSPGR

3.4.3. Human Core Scan Protocol

1. 3 Plane/Tri-Planar Scout/Calibration Scan
2. Sagittal 3D Accelerated MPRAGE/IRSPGR
3. Sagittal 3D FLAIR
4. Axial T2 Star/GRE
5. Axial 3D pCASL or Axial 2D PASL
6. Axial DTI
7. Axial Field Mapping Sequence
8. Axial fcMRI (Subject should have eyes OPEN)
9. Accelerated High Resolution Hippocampus Scan (Oblique – perpendicular to hippocampal tail)

3.5.   Phantom Naming Conventions

For entering in the scanner console and upload to the LONI ADNI3 Online Data Portal, phantom scans should follow the naming convention:

Patient Name and Patient ID: XXXPYYYY
X=3 digit Site# / P=Phantom / Y=last 4 digit Phantom#

For example, each phantom scan subject from site 001 should be coded:
001P1234

NOTE: Naming convention for MRI phantom differs from PET phantom convention

3.6.   Human Volunteer Scan Instructions

NOTE: IRB approval is required prior to conducting a volunteer scan

3.7.   Human (Volunteer) Naming Convention

For entering in the scanner console and upload to the LONI ADNI3 Online Data Portal, volunteer scans should follow the naming convention:

Patient Name and Patient ID: XXXV9999
X=3 digit Site# / V=Volunteer / 9999

For example, a volunteer scan subject from site 123 should be coded:
123V9999

NOTE: Naming convention for MRI volunteer differs from PET phantom convention

3.8. Data Transfer of Certification Scans

Please upload all sequences acquired for site certification to the LONI Online Data Portal as detailed in Section 10.

3.9. Site Certification Scan Results

The Mayo Clinic ADIR QC team will perform a quality control check on the phantom and/or volunteer scan data. Mayo Clinic ADIR QC team will determine if the correct parameters have been met and assure there are no other underlying problems seen during the scanning of these sessions. After successful qualification scanning, an official Site Certification e-mail will be sent to the selected contacts for your site and the ADNI3 Study contacts notifying them your site has been approved and is ready to scan subjects.

4. MRI SUBJECT PRE-SCAN PROCEDURES

4.1. Subject Pre-screening

All subjects should have been screened by the study coordinator for standard MRI contraindications. (An example of the Pre-Screen Form is available in Appendix 8.1.) However, subjects must be screened for MRI contraindications immediately before the MRI scan using your local standard protocol. Contraindications include, but are not limited to:

- The presence of non-removable ferrous metal objects
- Aneurysm clips
- Pacemakers
- Other contraindications such as defibrillators, etc.

4.2. Subject Safety and Monitoring

1. All sites should follow the standard subject consent protocols as approved by your local IRB.
2. Explain the scan procedure to the subject so that they know what to expect during the MRI.
3. Provide the subject with the opportunity to use the restroom before the scan begins.
4. Please use universal MRI safety precautions. Make sure that subject does not have any large ferrous metal on or inside of him/her such as shrapnel, a metal fragment in the eye, aneurysm clips, ear implants, spinal nerve stimulators, permanent makeup, or a pacemaker. Make sure that all loose metal objects are removed (Please refer to Appendix 8.1 Pre-Screening Form).
5. Patients are allowed to take their medications on the day of the scan. However, sedatives will interfere with the functional MRI and should be avoided if possible. If a patient has a prescription for a sedative (such as Valium) and this medication cannot feasibly be withheld, the sedation (agent, dose, time administered) should be noted on the MRI Scan Information Form.
6. Offer the subject hearing protection.
7. Please use standard local practice for monitoring the subject during the scan. These may include MRI safe devices to monitor pulse and O_2 levels.

4.3. Subject Positioning

1. Proper subject positioning is crucial for successful reproduction of serial MRI exams. Therefore, it is important that each subject is positioned in the same manner for each and every MRI exam.
2. Please follow the procedures below for positioning the subject in the head coil:

- Place clean sheet on scanner table and coil cradle.
- Besides standard room exclusions ensure the subject has removed their dentures as well as any hair clips, combs, earrings, necklaces, etc.
- Remove all upper body clothing with metallic trim, such as zippers, buttons or embroideries that may cause artifacts in the MRI images.
- Provide each subject with ear protection.
- Position the subject so their head and neck are relaxed, but without rotation in either plane. Proper placement in the head coil is crucial because scans are acquired straight, not in an oblique orientation. The subject should also be well supported in the head coil to minimize movement. Motion artifacts may result in data rejection and request for a re-scan in many cases.
- Support under the back and/or legs can help to decrease strain on the knees and back as well as assisting in the stabilization of motion in the lower body.
- Once subject has been positioned, place sponges along the sides of head and a Velcro strap across forehead (if available) for stabilizing support and reduction of motion.
- **Align the centering crosshairs on the subject's nasion** *(directly between the eyebrows)* **at every scanning session.**
- Center the head coil over the subject's head, making sure the subject is high enough in the coil to prevent signal loss at the inferior aspect of the brain.
- Offer each subject a panic button in case of emergencies or claustrophobia if common local practice at your facility (for example, a squeeze ball alarm.)
- Remind subject to hold as still as possible and advance subject to the iso-center of the scanning bore.

NOTE
- It is extremely important that the subject is positioned in the same manner, at the nasion, for the Baseline MRI exam and for all the subsequent MRI visits.
- It is imperative that the subject positioning procedures are followed exactly for all follow-up exams for a particular subject to ensure consistent imaging of the brain.
- If a deviation from these instructions is required to accommodate a subject, the MRI technologist must note this on the MRI Scan Information Form and refer to these notes during the follow-up exam.

5. MRI SUBJECT SCAN PROTOCOL

5.1. MRI Core Scan Sequences

ADNI3 Subject Scanning Sessions: (ALL SCANS SHOULD BE STRAIGHT - NON OBLIQUE)

5.1.1. Human CORE Scan Protocol

- (No adjustments should be made to this protocol)

1. 3 Plane/Tri-Planar Scout/Calibration Scan
2. Sagittal 3D Accelerated MPRAGE/IRSPGR
3. Sagittal 3D FLAIR
4. Axial T2 Star/GRE
5. Axial 3D pCASL or Axial 2D PASL
6. Axial DTI
7. Axial Field Mapping Sequence

8.　　　Axial fcMRI (Subject should have eyes OPEN)

9.　　　Accelerated High Resolution Hippocampus Scan (Oblique – perpendicular to hippocampal tail)

5.2.　MRI Example Images
5.2.1.　Human CORE Scan Sequences - Image Examples

The following pages are example images or what will be acquired for the ADNI3 study, as well as positioning recommendations.

5.2.1.1.　3 Plane/Tri-Planar Scout

Figure 4. Example of 3 Plane/Tri-Planar Scout

1. A quick acquisition in 3 orthogonal planes for anatomical orientation. One slice acquired in the middle of each plane (sagittal, coronal, transverse). The head should be centered laterally along the inter-hemispheric fissure and centered on the thalamus for the anterior/posterior and superior/inferior planes. Please use the images below as reference when determining if the subject is positioned properly.
2. Proper placement of the subject's head inside the head coil is crucial because scans are acquired straight, not in an oblique orientation.
3. If the subject is not positioned properly please adjust the subject in the head coil and re-scout. Continue repositioning and scouting until the subject is correctly centered in the head coil.

GOOD   NOT ACCEPTABLE
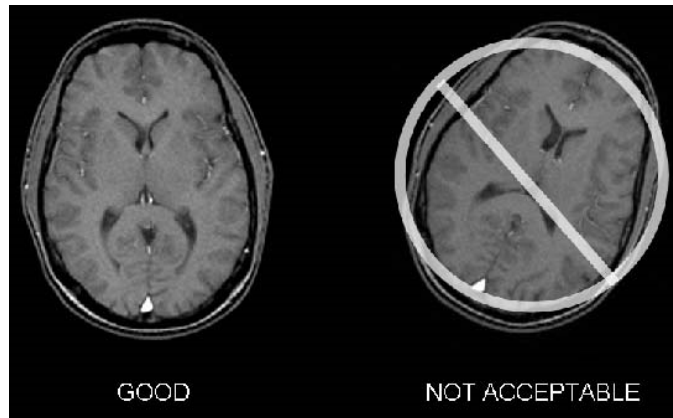
Figure 5. Make sure subject is aligned correctly in the head coil and is not rotated. Their head should be as straight as possible in the coil. Please adjust the subject if necessary.

4. ****Pre-scan Adjustments/Calibration Scans**: Most modern MRI scanners provide automated adjustment procedures for RF coil tuning and frequency adjustments after the subject is positioned in the magnet. Follow the adjustment procedures provided by the manufacturers.
5. **Positioning for all Axial Scans**:
    a. Orientation: **Straight** Axial. Prescribe slices inferior to superior. _**DO NOT Oblique Scans.**_
    b. Positioning: Position on mid-sagittal slice from tri-planar scout. Make sure to get full BRAIN coverage whenever possible. The acquisition stack should be placed just above the most superior point in the brain and should fully cover the cerebellum as well as all brain in the lateral and the anterior to posterior planes. If extra transverse slices are required to achieve this coverage please acquire those slices.

5.2.1.2.   Sagittal 3D Accelerated MPRAGE/IRSPGR
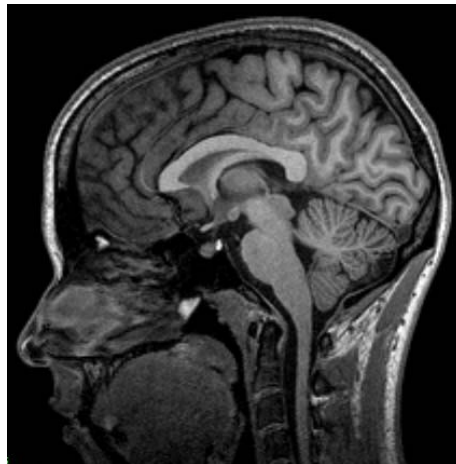

Figure 4. Example of Sagittal 3D Accelerated MPRAGE/IRSPGR

1. Orientation: **Straight** sagittal. Slices will be prescribed from left to right. _**DO NOT**_ oblique the scanning FOV to compensate for subject head tilt.
2. Positioning:

Use the tri-planar scout to position the acquisition box. Make sure to get full head coverage. **Studies that do not contain the whole brain and skull cannot be processed.** The skull must be fully included superiorly and laterally. The entire cerebellum should be included inferiorly. **In the anterior/posterior plane the nose should also be included otherwise image folding into the back of the brain will result and the exam may not be usable for the study**. Please see the images below and use as a guide to correctly position the acquisition box.
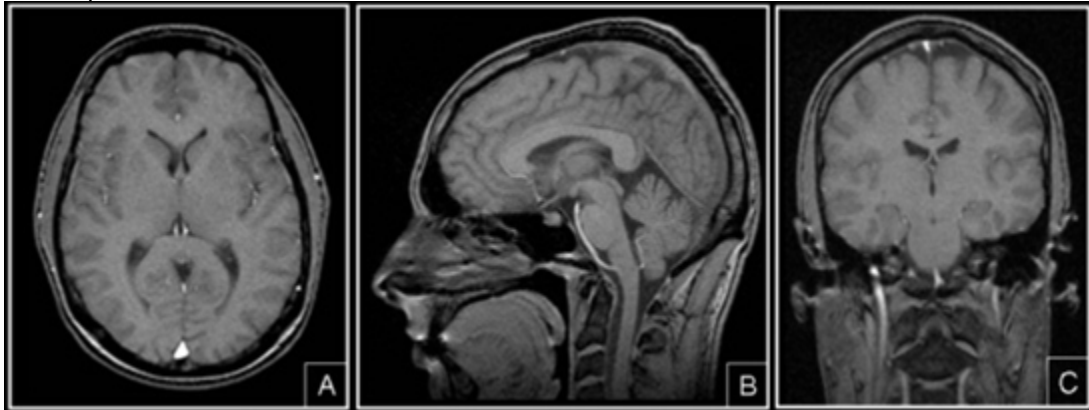
Figure 5. Example of 3 Plane Localizer for MPRAGE/IRSPGR FOV Placements.
Box A - Axial image: FOV placed in center to avoid side-to-side wrap.
Box B - Sagittal image: FOV placed anterior to avoid nose wrap.
Box C - Coronal image: FOV placed to assure opt of the brain is covered.

5.2.1.3. Sagittal 3D FLAIR [Straight, no oblique]
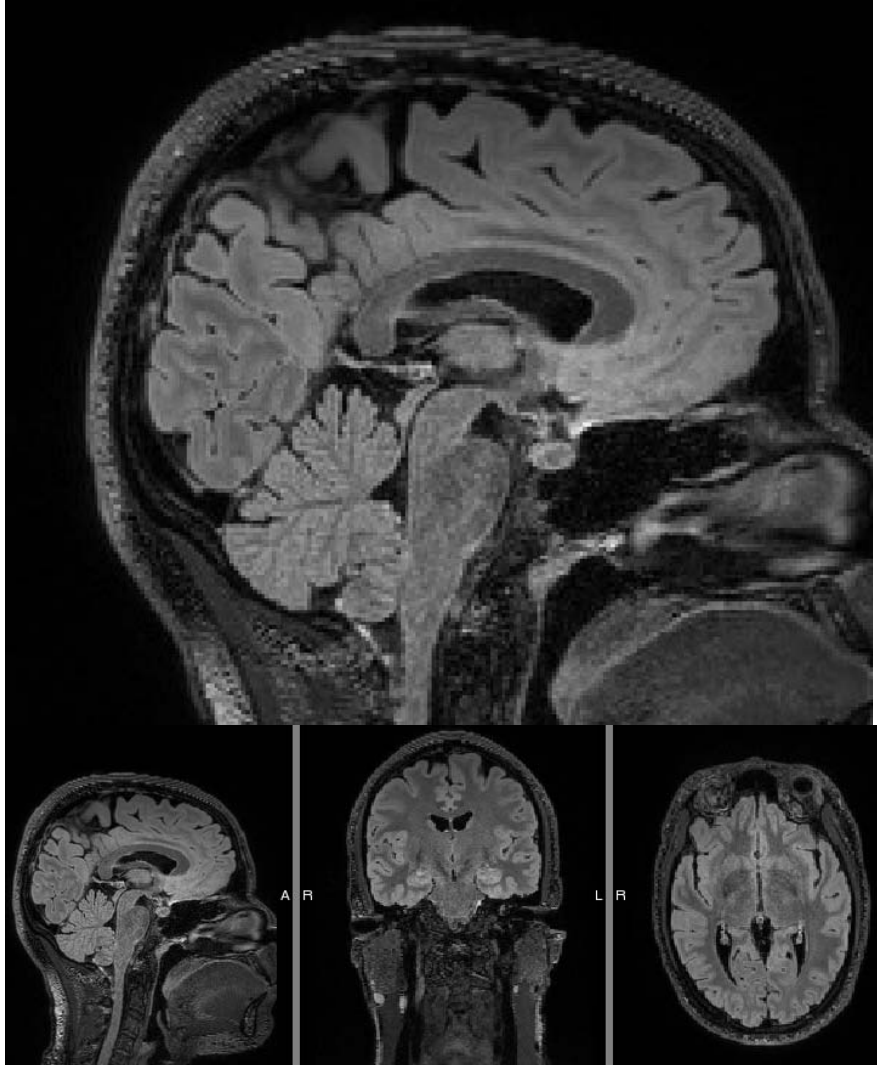
Figure 7. Example of 3D FLAIR

5.2.1.4. Axial T2 Star/GRE
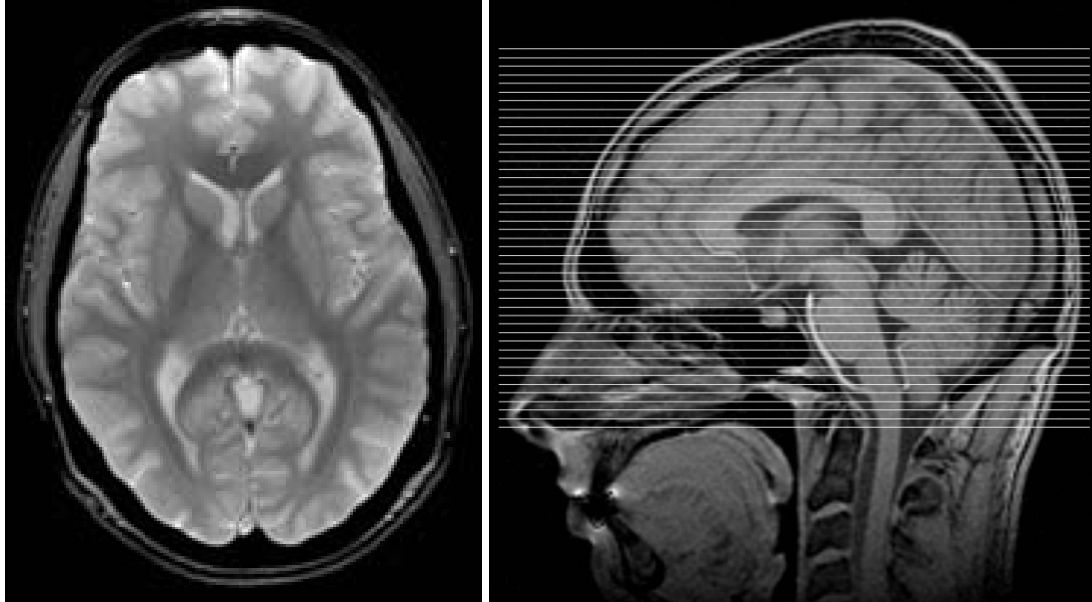
Figure 6. Example of Axial T2 star / GRE

5.2.1.1. Axial ASL (Arterial Spin Labeling) **[Straight axial, no oblique]**

Example:
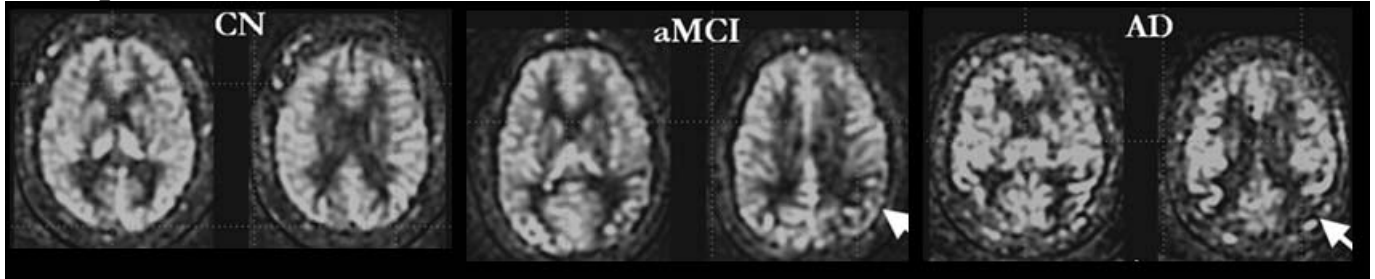
From Vemuri et al, submitted

Orientation: Straight Axial. Prescribe the 3D Slab inferior to superior. ** <u>DO NOT</u> *oblique the slab to compensate for subject held tilt. Scan as straight axial.*

**The inferior edge of the ASL volume must be positioned at the bottom of the cerebellum. As shown above.*

5.2.1.2.   Axial Diffusion Weighted Image (DTI) [Straight axial, no oblique]
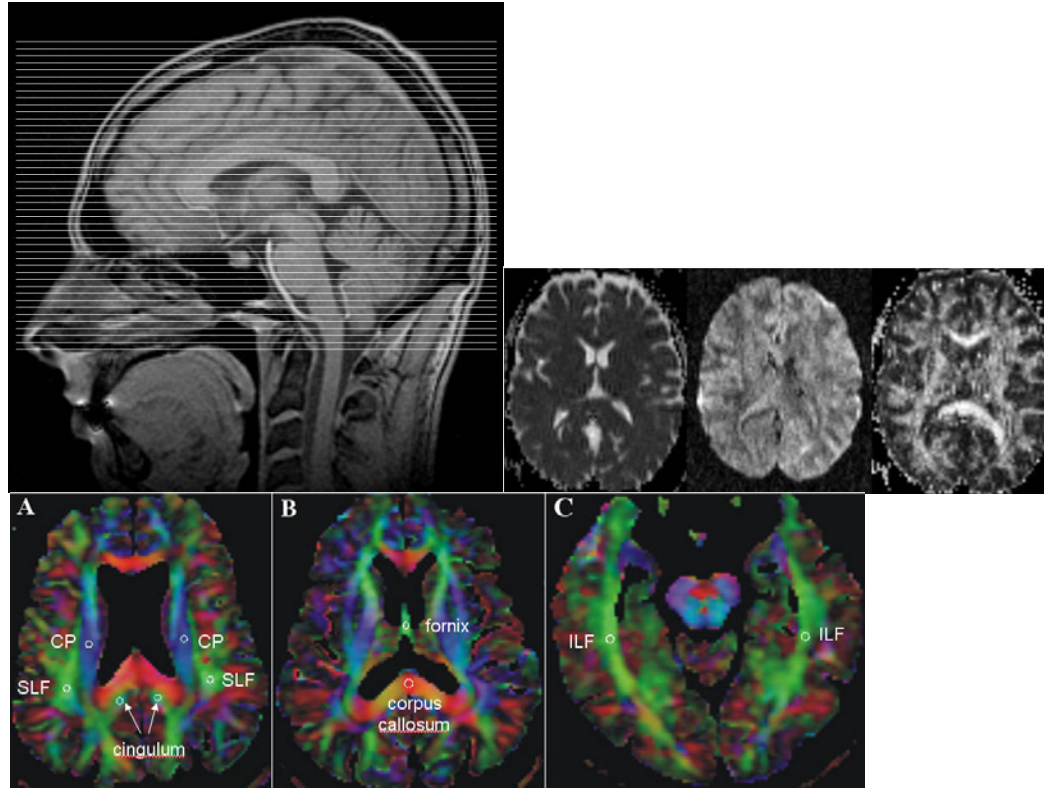
Figure 6. Example of Axial Diffusion Weighted Image (DTI)

1. Orientation: Straight Axial DO NOT Oblique Scans.
2. Positioning: Position on mid-sagittal slice from tri-planar scout. Make sure to get full BRAIN coverage. The acquisition stack should be placed just above the most superior point in the brain and should fully cover the cerebellum as well as all brain in the lateral and the anterior to posterior planes. If extra transverse slices are required to achieve this coverage please acquire those slices.
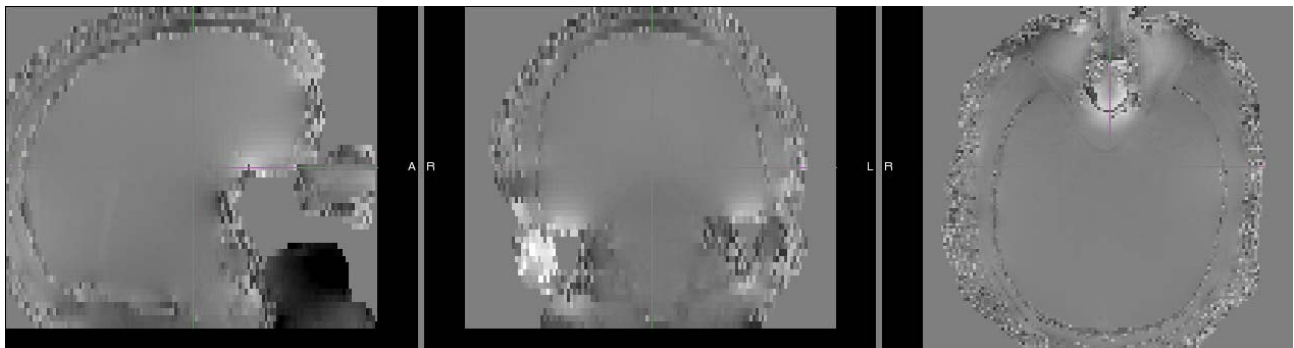
5.2.1.1.   Field Mapping Sequence [Straight axial, no oblique]

5.2.1.2. Axial functional connectivity MRI (fcMRI) [Straight axial, no oblique]
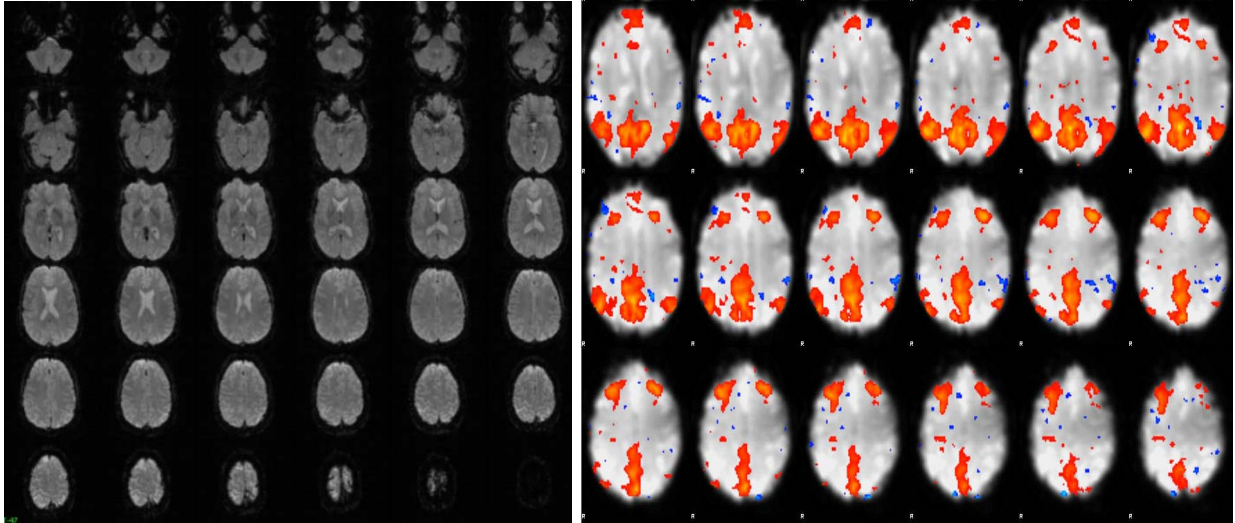
Figure 8. Example of Axial functional connectivity MRI (fcMRI)

1. Subject should have eyes OPEN
2. Orientation: Straight Axial DO NOT Oblique Scans.
3. Subject Instruction: Please instruct the subject to keep their eyes open during the entire scan. You can instruct them to focus on a point on the mirror or scanner. Also remind the subjects of the importance of holding their head still for the entire scan.
4. Positioning: Position on mid-sagittal slice from tri-planar scout.

Figure 9. Acquisition stack should be placed just above the most superior point in the brain and should cover the cerebellum, if possible.

5.2.1.3. High Resolution Hippocampus Scan (Oblique)
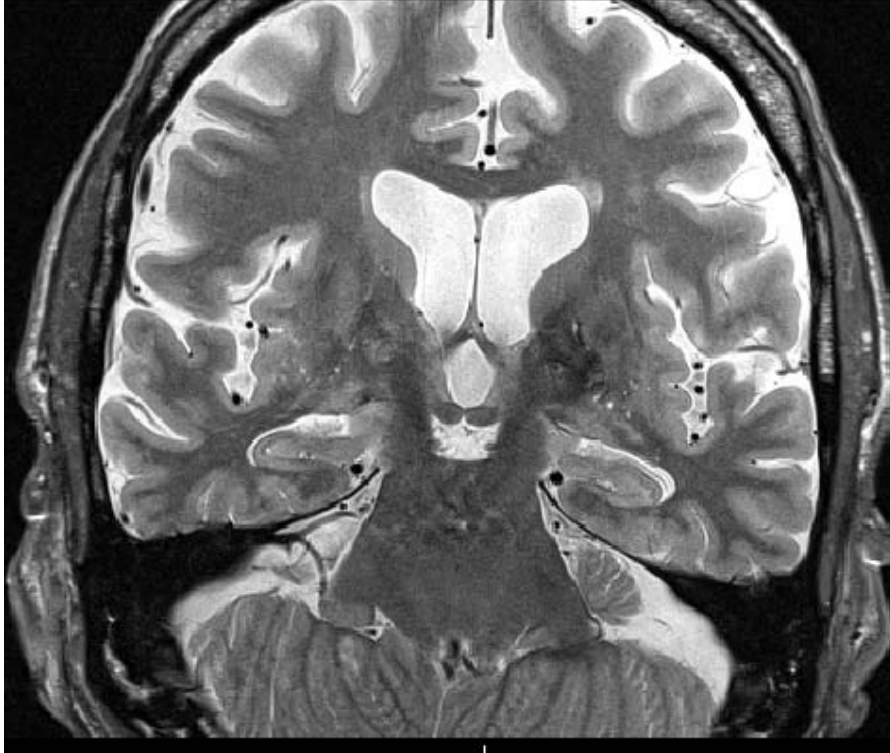
Instructions for positioning

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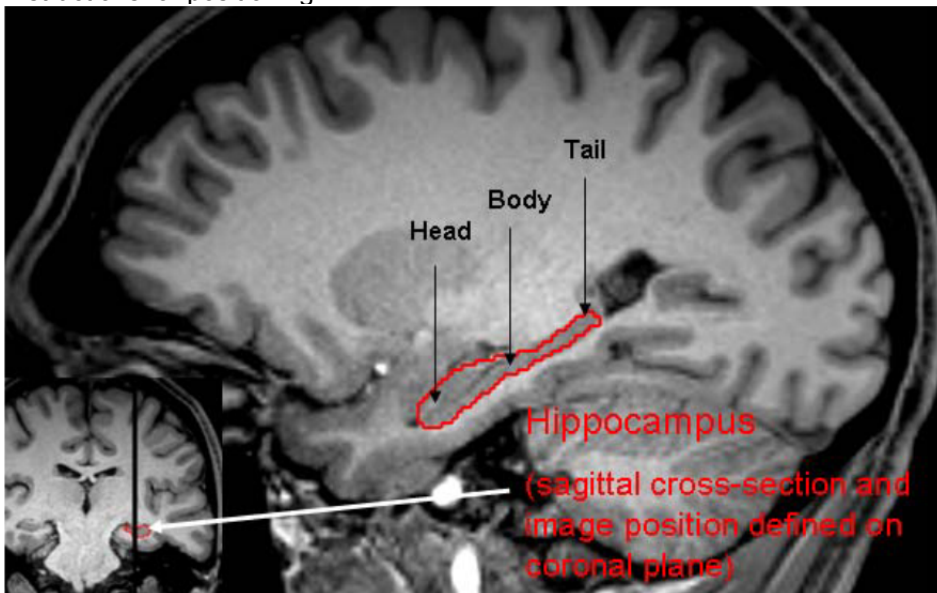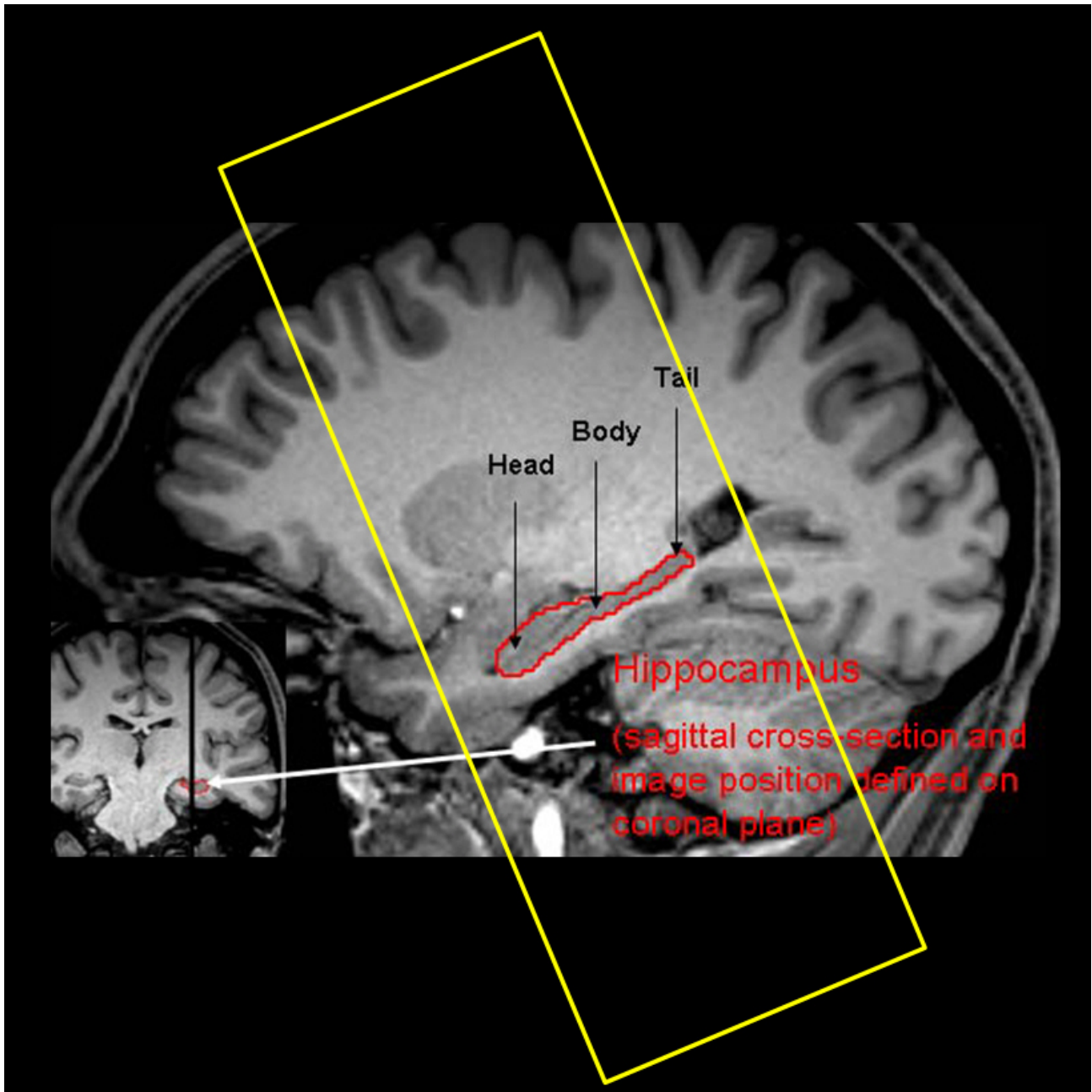
Most Superior portion of the FOV should be placed so that top of the skull in included
Position the FOV so that it covers the entire Hippocampus from head to tail.

Use only the electronically imported ADNI3 sequences.

6. MRI SUBJECT SCAN PROCEDURES

6.1. MRI Scan Information Form

1. The "MRI Scan Information Form" should be completed at the time of acquisition for every ADNI3 subject. (An example of the MRI Scan Information Form is available in Appendix 8.2.) A copy of the MRI worksheet is located in the study visit packet posted to the LONI ADNI3 Online Data Portal.
2. The Study Coordinator at the referral site should complete the top section of the MRI Scan Information Form. If this section is incomplete, please contact the Study Coordinator for the information.
3. The MRI Technologist should complete the remainder of the form during the scan. Please be sure to indicate if each sequence has been completed and note any problems or modifications to the protocol in the appropriate sections. This enables the Mayo Clinic ADIR QC team to more closely follow each scanning session and note if data transfer and archive have been completed.
4. Please complete the form in full and transfer to the Study Coordinator at the referral site. The Study Coordinator will enter the information into the ATRI EDC System and this will be linked with the subjects' MRI data. Please keep a copy on site for your records.

To report an incident regarding the MRI sequences please email: **ADNIMRI@mayo.edu**
To report an incident about a specific subject, please contact your Study Coordinator.

6.2. Entering Subject Information into the Scanner

Although the scan header will be de-identified and rendered HIPAA compliant when data is entered in the LONI ADNI3 Online Data Portal, if at all possible your site is requested to use the ADNI3 subject naming convention below when entering the subject information into the scanner.

6.3. Subject Nomenclature

For entering in the scanner console and upload to the LONI ADNI3 Online Data Portal, participant scans should follow the naming convention:

Patient Name and Patient ID FORMAT: XXX_S_YYYY
X= 3 digit SiteID #,_S_ = subject, Y= 4 digit Subject ID#

For example, the fourth subject from site 123 should be coded:
123_S_0004

(The 4 digit subject ID number will be provided by your Study Coordinator)

*** It is imperative that the Participant ID number is reported exactly per naming convention, XXX_S_YYYY in "PatientsName" and "PatientID" fields.

6.4. Scan Discontinuation

If the subject elects to discontinue the MRI because of discomfort every effort should be made to adjust the table, head coil, etc. and finish acquiring the scan. However, if the subject still does not

want to complete the scan, then the MRI should be abandoned and noted as incomplete on the ADNI3 MRI Scan Information Form. The comments section should include the reason the subject was unable to complete the MRI.

6.5. Archive Procedures

Every MRI scan for the ADNI3 Study must be archived at the MRI facility following standard local practice. Additional data transfers or copies may be requested in the event that a data transfer is interrupted or incomplete. Possible MRI archive mediums include:

- Optical Disk
- PACS
- CD or DVD

6.6. Data Transfer

Each site will upload the subject data to the LONI ADNI3 Online Data Portal within 24 hours after the completion of the scan.

6.7. Request for Repeat MRI Scans

6.7.1. Reasons for MRI Repeats

A request for a repeat MRI may be required in the event that the scans are found to be unacceptable due to subject motion or an incomplete/incorrect MRI acquisition. Your site will be asked to schedule a repeat study.

Mayo Clinic ADIR QC team will check all ADNI3 MRI scans to be sure that the exam was conducted on the one scanner qualified for ADNI3 at your site was used, and that the correct, electronically loaded sequences have been used to scan each subject. Repeat exams may also be required if the incorrect scan sequence, orientation, or angulations are used. It is imperative to use the ADNI3 approved acquisition sequence with every ADNI3 subject. Scans with image degradation due to the incorrect scan sequence, orientation, or angulations will **NOT** be reimbursed nor will scans acquired on any scanner other than the one qualified for ADNI3. Re-scans will be reimbursed if the correct scan sequence, orientation, and angulations were used.

6.7.2. Procedures for MRI Repeats

Repeat MRI scans should be performed as quickly as possible. The Mayo Clinic ADIR QC team will contact the referral site as well as the MRI facility requesting a repeat MRI. Detailed information regarding the reason for the repeat as well as suggestions for improvement will be communicated to both sites.

7. QUALITY CONTROL AND PHANTOM SCANS

Sites will only be required to scan the ADNI phantom at initial site certification, software/hardware upgrades, or when significant maintenance is performed.

Please see instructions for scanning the phantom in the MRI site qualification Section 3.4.

7.1. Hardware and Software Upgrades

To avoid any delays or mistakes in scanning, the Mayo Clinic ADIR QC team requires notification at least 2 weeks *PRIOR* to any software and/or hardware upgrades for any scanner involved in the ADNI3 imaging study so they can provide your site the correct upgraded protocols if needed.

At the time of your sites MRI Scanner upgrade the MRI site will be required to scan a phantom or a human volunteer (dpending on the nature of the upgrade) prior to continue scanning study subjects.

IMPORTANT:
If a site fails to perform these human or phantom scans and/or they have not been performed within 2 weeks of the upgrade, ADNI3 may not accept or reimburse the subsequent subject scans. The study coordinator and the principal investigator at each site will be notified if a phantom scan has not been received within that time frame.

If you have questions regarding this procedure, please contact: ADNIMRI@mayo.edu

7.2. Data Transfer

Each site will upload the phantom data to the LONI ADNI3 Online Data Portal within 24 hours after the completion of the scan as detailed in Section 10.

7.3. Measurements

The Mayo Clinic ADIR QC team will perform the following measurements on the phantom data: linear scaling, gradient non-linearity, and signal-to-noise.

7.4. Phantom Results and Site Notification

The Mayo Clinic ADIR QC team will examine each phantom data set to ensure that there are no underlying problems with the scanning session, and that the scanner has not drifted out of specification. When finished, if there is an issue that needs to be addressed, an email will be sent to your site notifying you of the problem.

8. APPENDICES

8.1. MRI Pre-Screening Form – Example

The following is an example of the form subjects complete with the study coordinator prior to their MRI scans. The study coordinator should notify the MRI site if the subject has indicated yes for any items that may pose a risk to the subject (i.e. internal metal) during the MRI. This form should not be a substitute for your standard pre-screening form.

MAYO CLINIC

MRI Pre-Screening Form

➢ THE FOLLOWING ITEMS MAY BE PERSONALLY HARMFUL AND/OR INTERFERE WITH MRI SCAN.
➢ You may be required to wear earplugs or earphones during the MRI scan.
➢ A **YES** or **NO** answer must be provided for every item. If any question, please ask a staff member for help.

YES	NO	ITEM
		Claustrophobic
		Cardiac pacemaker, pacer wires, or defibrillator
		Any coil, filter, stent or valve (Type:_____)
		Aneurysm clip(s)
		Implanted drug pump(s) (Type:_____)
		Penile implant (Type:_____)
		Tissue expander (e.g. breast)
		IUD or Pessary (Type:_____)
		Orthopedic fixation device, internal or external?
		Any implanted items (e.g. pins, rods, screws, wires, nails or plates)
		Artificial limb or joint (Location:_____)
		Any type of metal objects, shrapnel or bullet anywhere on your body
		Cochlear or stapes implant
		Hearing aid(s) (**Remove before MRI scan**)
		Eyelid spring or artificial eye
		Medication patch (hormone, nicotine, catapres-TTS) (**Remove before MRI Scan**)
		Shunt
		Allergies (Type(s):_____)
		Implanted radiation seeds for cancer treatment
		Removable dentures, false teeth or partial plate
		Tattoos or tattooed eyeliner
		Any history of cancer
		History of chronic renal disease
		Receiving hemodialysis / peritoneal dialysis
		Renal transplant or evaluation for renal transplant
		Surgical procedures/operations (Type:_____)
		Braces
		Any metallic foreign objects in your eyes

IF YOU HAVE ANY OF THE FOLLOWING ITEMS, PLEASE REMOVE			
Keys	Belt	Credit cards	Hairpins
Jewelry	Metal buttons	Money clip	Barrettes
Watch	Pocket knife	Coins	Safety pins
Beeper/Pager	Cell phone	Pens	Clothing with metal

I attest that the above information is correct to the best of my knowledge. I have read and understand the entire contents of this form and I have had the opportunity to ask questions regarding the information on this form.

Print Participant's Name:_____

Participant's Signature:_____ Date:_____

Signature of person completing form:_____

A4 – MRI Pre-screening Form   Page 1 of 1   Last modified: 02 December 2013
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8.2. MRI Scan Information Form – Example

The "MRI Scan Information Form" should be completed at the time of acquisition for every ADNI3 subject.

The Study Coordinator at the referral site should complete the top section of the form. If this section is incomplete, please contact the Study Coordinator for the information.

The MRI Technologist should complete the remainder of the form during the scan. Please be sure to indicate if each sequence has been completed and note any problems or modifications to the protocol in the appropriate sections. Also, note if data transfer, archive, and local copy for clinical reads have also been completed.

Please complete the form in full and transfer to the Study Coordinator at the referral site. Please keep a copy on site for your records.

MAYO CLINIC

3T MRI Scan Information Form

Participant Information

Participant ID	Session ID	Date of Scan
		/ /

Visit: _____

Site Information

Site Code:	
Study Coordinator Name:	
Participant Initials:	
MRI Technologist Initials:	

**Important: It is mandatory that the A4 site qualified scanner be used for ALL participants in the A4 study. **It is also mandatory that the same A4 approved sequences are used for all A4 subject scans. Do NOT adjust protocol values.

Was the scan conducted?
☐ Yes
☐ No

Reason why the scan was not conducted:
☐ Illness
☐ Participant unavailable
☐ Participant unwilling
☐ Administrative problems
☐ Withdrawn consent
☐ Other (specify)

If Other, specify:

Placed marker on the subject's right temple (RT): ☐ Yes ☐ No

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SCAN 1: 3 Plane/Tri-Planar Scout: **Check the subject positioning in the head coil. Re-position and re-scout if necessary.

Completed?
☐ Yes
☐ No
NOTES:

SCAN 2: Axial T2 Star/GRE: Position slices to cover below cerebellum through the top of the head. *DO NOT* oblique the scanning slices.

Completed?
☐ Yes
☐ No
NOTES:

SCAN 3: Axial T2 FLAIR: Position slices to cover below cerebellum through the top of the head. *DO NOT* oblique the scanning slices.

Completed?
☐ Yes
☐ No
NOTES:

SCAN 4: Axial fcMRI *(Subject should have eyes OPEN):*
**The acquisition stack should be placed just above the most superior point in the brain and should cover inferior as much as possible. If the cerebellum is not covered fully, that is acceptable. Instruct the subject prior to this scan that they should have their eyes open and to hold very still. *DO NOT* oblique the scanning slices.

Was the subject instructed to open their eyes?
☐ Yes
☐ No
Did the subject keep their eyes open? (MRI Tech: ask the subject right after the scan)
☐ Yes
☐ No
Completed?
☐ Yes
☐ No
NOTES:

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SCAN 5: Sagittal 3D Accelerated MPRAGE/IRSPGR: *DO NOT* oblique the scanning slices.

Completed?
☐ Yes
☐ No
NOTES:

SCAN 6: Axial DWI: Position slices to cover below cerebellum through the top of the head. *DO NOT* oblique the scanning slices.

Completed?
☐ Yes
☐ No
NOTES:

SCAN 7: Axial T2 FSE/TSE: Position slices to cover below cerebellum through the top of the head. *DO NOT* oblique the scanning slices.

Completed?
☐ Yes
☐ No
NOTES:

Phantom QC Scans:
Your site is not required to do phantom scans along with A4 MRI subject scans. Phantoms scans will only be required at site certification and software/hardware upgrades.

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Patient motion problems:
☐ Yes
☐ No
If yes, describe:

Scanner malfunction:
☐ Yes
☐ No
If yes, describe:

Other protocol variations:
☐ Yes
☐ No
If yes, describe:

Was data transferred to the ADCS A4 Data Portal within 24 hours of scan?
☐ Yes
☐ No   If No, please explain:
Transfer Date:

Month / Day / Year

Data Archived Locally?
☐ Yes
☐ No   If No, please explain:
Archive Medium
☐ PACS
☐ CD/DVD
☐ MOD
☐ Other

Was a lumbar puncture completed prior to the MRI scan? (Question to be completed by the study coordinator)
☐ Yes
☐ No
If Yes, what was the interval between LP and MRI?

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9. FREQUENTLY ASKED QUESTIONS

Q – My subjects head is tilted quite a bit. Can I oblique the scans then?
A – No, do not oblique the scans, we can deal with the subjects head being tilted more easily than we can with scans that were acquired obliquely.

Q – I noticed some wrap on my image. Should I increase the FOV to compensate?
A – No, unless the wrap is affecting brain tissue you do not need to re-scan. If the wrap is affecting brain tissue please try to place the FOV to avoid wrap if possible.

Q – Should I append this scan to the previous scan in the PACs system.
A – Please do not append the sessions; it causes the exams all to have the same UID.

Q – Do I need to have the subject remove their dentures?
A – Yes, please have all your subjects remove their dentures to avoid artifact.

Q – I am having trouble with upload data to the LONI ADNI3 Online Data Portal, who do I contact?
A – dba@loni.usc.edu

Q – The exam was already uploaded to the LONI ADNI3 Online Data Portal; do we need to keep a copy of it?
A – Yes, please keep a copy of all human AND QC phantom scans your site performs.

Q – Our scanner was upgraded, do I need to re-certify?
A – Probably not, if your site just had a software upgrade please just scan the phantom QC scans. If your site had a major upgrade, you may be asked to conduct both a phantom and volunteer scan.

Q – What are some common reasons for a rescan?
A – Assuming the site followed the ADNI3 MRI protocol, most rescans are required due to subject motion. Please try to repeat the core sequences if they contain significant motion (3D T1 / T2 FLAIR / T2 Star/GRE). If those sequences are not usable, a rescan will be requested. If the site did NOT follow the ADNI3 MRI protocol, a rescan will be requested for protocol non-compliance.

LONI IMAGE & DATA ARCHIVE

Archive Images

Laboratory of Neuro Imaging

Dr. Arthur W. Toga, Director

January, 2016

ARCHIVE IMAGES

There are two steps in the archive process: de-identification and file transmission. The de-identification step removes or replaces potentially identifying subject information from the image headers. Next, a Java applet de-identifies the files, inserting a user-supplied subject identifier and removing or replacing other potentially identifying information. The user is given the opportunity to validate the de-identification results, prior to transmitting the images. Once the results of the de-identification process have been validated, the files are transmitted from the user's local computer to LONI. Upon arrival at LONI, the data are stored in a fault-tolerant storage area network and the database is populated with relevant metadata attributes.

There are two methods for uploading images – Single and Batch Archive, each with its own distinct advantages. See Selecting Archive Method.

The data archive accepts DICOM files (Type 1 headers), and files with limited header information, such as Analyze, MINC, and NIfTI (Type 2 files). Type 2 files may only be archived after the corresponding Type 1 (raw) file is archived. Archiving Type 2 files, or processed images, requires additional user input to provide image metadata.

Archive Method	• Single • Batch (Multiple)
Data Types	• Original (raw image files) • Processed (pre and post processed)
Image File Formats	• Type 1 (DICOM) • Type 2 (ANALYZE, MINC, NIfTI)
De-Identify	• Remove potentially subject-identifying information
Archive	• FileTransmission • File Archiving

Selecting Archive Method (Single or Batch Archive?)

If you are archiving a set of images from only one subject, all in the same format, Single Archive will be suitable. For larger datasets with multiple subjects, Batch Archive is preferable. The schematic below outlines the major differences.

Batch Archive	**VS**	**Single Archive**

Batch Archive
- Archive image files from multiple subjects simultaneously.
- Archive files with differing file formats or image modalities simultaneously.
- Less time consuming alternative for archiving multiple studies.
- Automated Process requiring minimal interaction.
- Subject and phantom scans acquired on a single day may be uploaded in the same session.

Single Archive
- Archive image files from only one subject at a time.
- Archive files with only one type of file format or image modality.
- Allows for more user interaction.
- Examine list of de-identified files and corresponding header information before transmission.
- Select which series should be archived when multiple series are available.

The Archive Menu
For all archive options select the Archive menu option.

Archive Raw Images (Type 1)
Before any processed images can be uploaded, the original DICOMs must be archived. The following categories outline how to Single and Batch archive DICOMs. Note, most users will only be archiving raw images. Only select users are given permissions to upload processed images, and they will be trained by the Project Specialist.

REQUIREMENTS:
1. Place all image files for each subject within a single directory (source directory) which may contain subdirectories. The source directory must not contain multiple image formats.
2. Create an empty directory where the de-identified files will be written (target directory)
3. The browser window must remain open during the entire upload process. Closing the browser window cancels the upload. You may minimize the window.

Single Archive
Use the Single Archive process to upload one or more files from a single subject.

Navigate to the Archive and Review page from the Archive menu.

1. Select your Project/ Site (1) from the drop down menu.
2. Select the Single Archive (2) button.

Archive and Review

PROJECT INFORMATION:

Select Project: ADNIDOD@University of Southern California ⬅ 1

ARCHIVE FILES:

The data archival process involves two basic steps:
1. De-identify the header file by replacing any fields that identify the subject, such as Patient Name and ID, and
2. Transmit image data securely from the local site to LONI.

To archive a single study, click the SINGLE ARCHIVE button.   [→ SINGLE ARCHIVE] ⬅ 2

To archive multiple studies in batch mode, click the BATCH ARCHIVE button.   [→ BATCH ARCHIVE]

NOTE: Do not open multiple IDA browser windows while archiving data.

VIEW RECENTLY ARCHIVED VOLUMES:

Click on the VIEW button to visualize the volumetric representation of your uploaded files.
Click on the REFRESH button to update the volume list.

[→ REFRESH]

SUBJECT ID	SERIES DESCRIPTION	NO OF IMAGES	DATE ▲	View	Download

You will be directed to the De-Identification page.

1. Select the type of data being uploaded – in this case, 'Original' (1).
2. Select the Visit number, if this is an option (2)
3. Provide the Subject ID (3) you provide replaces the existing Patient ID in the image file(s). It is recommended that a separate cross reference of original and replacement subject identifiers are kept externally.
4. Select the Source Directory (4) where the images are contained
5. Select the Target Directory (5) for de-identified files to be written to.
6. Select CONTINUE (6) to begin the de-identification process.

Please follow the instructions outlined above:

Project ADNIDOD@USC   ☐ Bypass validation steps

Select Data Type ◉ Original ○ XML ⬅ 1

Visit [▼] ⬅ 2

Subject ID: [   ]   Max. 10 characters allowed ⬅ 3
Identifier to replace Patient ID

Source Directory: [   ] [BROWSE...] ⬅ 4
Location of original files

Target Directory: [   ] [BROWSE...] ⬅ 5
Location for target files

NOTE: Source Directory for file formats with complete headers (DICOM, GE, ECAT, etc) may contain multiple series from a single subject. Source Directory for file formats with limited headers (ANALYZE, MINC) or no headers (TIFF, TGA, etc) must contain a single series for a single subject in a single directory. Headerless files must contain a sequential slice number within the file name. ANALYZE files are assumed to be in SPM orientation.

[→ CANCEL]   [→ CONTINUE] ⬅ 6

On the Verify and Submit page

1. Deselect (1) any image you do not want to be archived. Just deselect the corresponding check box.
2. Select SUBMIT (2) to begin the transmission process. Note: This is not a feature with Batch Archive

Once transmission has begun, a progress bar will show the status of the upload.

Once complete, click REVIEW UPLOADED FILES to view a list of the archived images on the Archive and Review page, or click ARCHIVE MORE to upload files for another subject. If you need to continue archiving files for separate subjects, consider using the Batch Archive function instead.

Batch Archive

The Batch Archive process is similar to Single Archive, except that multiple subjects and image series can be submitted in a batch. Batches can be of the same or different file formats and modalities. However, users cannot review the results of the de-identification process prior to the batch upload.

Navigate to the Archive and Review page from the Archive menu.

1. Select your Project/ Site (1) from the drop down menu.
2. Select the Batch Archive (2) button.

Archive and Review

PROJECT INFORMATION:

Select Project: ADNIDOD@University of Southern California ▾ ← 1

ARCHIVE FILES:

The data archival process involves two basic steps:
1. De-identify the header file by replacing any fields that identify the subject, such as Patient Name and ID, and
2. Transmit image data securely from the local site to LONI.

To archive a single study, click the SINGLE ARCHIVE button.　　　　　　　　　　　　　　　▣→ SINGLE ARCHIVE

To archive multiple studies in batch mode, click the BATCH ARCHIVE button.　　　　　　　　▣→ BATCH ARCHIVE ← 2

NOTE: Do not open multiple IDA browser windows while archiving data.

VIEW RECENTLY ARCHIVED VOLUMES:

Click on the VIEW button to visualize the volumetric representation of your uploaded files.
Click on the REFRESH button to update the volume list.

▣→ REFRESH

SUBJECT ID	SERIES DESCRIPTION	NO OF IMAGES	DATE ▲	View	Download

3. Proceed to follow the De-identification steps in the Single Archive chapter.
4. The Batch Archive will skip the Verify and Submit step that is available in Single Archive, and direct you to the Image Database Batch Queue page.
5. Select ADD MORE (1) to add more images to the Batch. Repeat this process until you have added everything you intend to archive.
6. Click SUBMIT (2) to begin both the de-identification and transmission processes.

Image Database Batch Queue

B	REVIEW BATCH QUEUE

THE IMAGE STUDIES LISTED BELOW HAVE BEEN PREPARED FOR BATCH DE-IDENTIFICATION AND UPLOAD.

- Click "ADD MORE" to add another study to the queue or "SUBMIT" to archive this batch now.
- REMEMBER to leave your browser window open until all uploads are complete and you have been returned to this page or the Archive & Review page.
- Click "CLEAR" to clear the batch queue. All logs will be deleted.

CANCEL

Subject	Data Type	Research Group	Source	Status	Date	Remove
PAD_0006	Original	Control	D:/ivani/test_data/UCLA/D1017/SO...	Queued	7/12/11	remove
PAD_0007	Original	Control	D:/ivani/test_data/UCLA/D1017/SO...	Queued	7/12/11	remove

1 ↓　　　　　　2 ↓

CLEAR	ADD MORE	SUBMIT

Once transmission has begun, each subject will be de-identified, and then archived, consecutively. A progress bar will show the status of each upload.

Once complete, click REVIEW UPLOADED FILES to view a list of the archived images on the Archive and Review page, or click ARCHIVE MORE to upload files for another subject. If you need to continue archiving files for separate subjects, consider using the Batch Archive function instead.