General Experimental

1. Introduction

1.1 Research involving Magnetic Resonance Imaging (MRI) at high magnetic field strengths presents unique hazards to both research subjects and individuals working within and around the MRI system. Consequently, the potential for serious personal injury is present due to the sheer magnitude and strength of the static magnetic field along with the immense flexibility of the research system and associated peripheral hardware.

1.2 The static magnetic field in the CFMM MRI facilities is always present. It is essential that everyone entering the facility is aware of the presence of the magnetic field, since we cannot otherwise detect it (i.e. magnetic fields cannot be seen or felt).

1.3 Due to the inherent hazards associated with the static magnetic field, access to the CFMM MRI Zones III and IV is restricted to ensure the safety of all patients, subjects, visitors, and staff. The CFMM Core Facility is conceptually divided into four Zones of increasing level of potential risk and access restriction.

1.4 Dangerous and potentially lethal levels of electricity are used by MRI systems. Therefore, it is important that all individuals involved with MRI research be aware of the dangers and understand the safety issues concerning electricity. Current-carrying cables, connections, and junction points in the vicinity of the main magnetic field are particularly susceptible to damage due to the extreme Lorentz forces created through the normal operation of the system. Periodically, the effects of prolonged mechanical fatigue may result in breakage, thereby causing electrical arching, sparking, and high heat levels before the system can shut down. In these instances there is a high potential for personal injury as well as the possibility of a fire being ignited.

1.5 During certain types of MRI data collection, high and potentially dangerous acoustic sound pressure levels (SPL) are generated. Everyone entering the facility must be made aware of this risk and be instructed as to the precautionary measures that must be taken.

2. General Set-Up Procedure

2.1 All studies must have approved Human Subject Review Ethics Board (HSREB) or Animal Care Committee (ACC) protocols in place before commencing, according to SOP#140: "New Studies and Ethics".

2.2 All volunteers, patients, and Research Personnel entering MRI Zone IV areas (magnet rooms) within the CFMM must be screened using the facility's "Magnetic Resonance Environment Screening Questionnaire" and have it reviewed, signed and approved by authorized Level 2 MRI Personnel.

2.3 The volunteer/patient, Research Personnel, MRI Technologist/Operator, and anyone else entering Zone IV (magnet room), must remove all metallic objects from their person.

2.3.1 The MRI Technologist/Operator is responsible to evaluate all objects entering Zone IV for ferrous components or function which could interfere with MRI operation.

2.3.2 All objects, not already in Zone IV, should not be brought into the magnet room, unless they are necessary for the successful execution of the experiment, and have been tested and permitted for entry by Level 2 MRI Personnel.

2.4 Any patients, research volunteers, or other personnel present in MRI Zone IV (magnet room) during an MRI scan must wear appropriate hearing protection.

2.5 The MRI Technologist/Operator will advance the volunteer/patient or animal into the bore of the MRI scanner at his/her own discretion. If the operator at any time feels that it is not safe to advance the volunteer/patient or animal into the scanner, or in the case of human experiments, where subject is unwilling to proceed (e.g. due to claustrophobia), or for any other reason, the Technologist/Operator may refuse to continue and may cancel the scan session at the research group's expense.

3. Responsibilities of the MRI Technologist/Operator

3.1 To ensure the physical and emotional safety (human studies) of all volunteers/patients or animals and associated Research Personnel within Zone IV (magnet room). This responsibility includes screening all individuals and objects for safety, explaining the MRI procedure, providing and enforcing the use of hearing protection, and informing Research Personnel of the critical operating areas.

3.2 To ensure that all necessary patient safety devices are operational and utilized for a scan session. It is at the discretion of the operator to cancel the scan session at any time if any or all of the safety devices are not operational. Patient safety devices are listed below; not all safety devices are necessary for all experiments.

3.2.1 Emergency squeeze ball
3.2.2 Audio system
3.2.3 In-bore camera
3.2.4 Infrared camera
3.2.5 Physiological monitoring devices
  3.2.5.1 ECG
  3.2.5.2 Pulse oximeter
  3.2.5.3 Respiratory belt
3.2.6 Crash cart / AED
3.2.7 Fire extinguisher
3.2.8 Smoke detector

3.3 To notify the CFMM Director or the Senior MRI Research Technologist of any OEM provided hardware such as patient safety devices, RF coils, communication systems that are not operational or report a malfunction/error state of the MRI system to Siemens Service (3T/7T) or Bruker (9.4T).

3.4 To notify the appropriate CFMM staff member if any peripheral device is not operational. Peripheral devices include but are not limited to:

3.4.1 Stimulus Projection Systems
3.4.2 Control or Stimulus Presentation Computers or Devices

3.4.3 Projection Screens

3.5 To screen all items entering Zone IV (magnet room) for ferrous components. First level screening can be performed with a strong hand-held magnet that is available for such testing.

3.6 To replace linen on the patient bed and place soiled items in the LHSC provided laundry bags for return.

3.7 To return all peripheral devices and any other item used during the scan session to their proper storage location upon completion of the scan session.

4 Intravenous Access, Injections, and Contrast-Enhanced Studies (3T/7T MRI)

4.1 Human studies involving the injection of gadolinium-based contrast media or other intravenous (IV) agents may be conducted as long as the appropriate Review Ethics Board (REB) protocols and approvals are in place as per SOP#140: "New Studies and Ethics".

4.2 Due to the potential for adverse reactions, a licensed physician must assume responsibility and be "on-site" during the injection of any gadolinium-based contrast media. It is the responsibility of the study's Principal Investigator (PI) to ensure a collaborating physician is involved, as one will not be provided by the CFMM Core Facility.

4.2.1 Should a severe adverse reaction occur, the CFMM Core has LHSC Code Blue coverage, as outlined in SOP#120: "Emergency Code Blue".

4.3 Peripheral IV lines may only be inserted under the direction and supervision of the study physician and performed by Level 2 MRI Personnel, Level 1 MRI Personnel, Research Personnel, or other associated study staff who:

4.3.1 Hold Intravenous Certification, either by the successful completion of an academic course or have completed appropriate training as determined by the study's supervising physician.

4.4 Intravenous injections of gadolinium-based contrast media or other agents may only be performed by those holding Intravenous Certification, and who are acting under the direction and supervision of a physician.

Revision Chronology		
Version Number	Date	Changes
200.01	15 August 2008	First Version
135.02	07 May 2020	Combination of 3T 7T and 9.4T

CFMM Director Signature: _____

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