## Tier 1 – SCI Diffusion Tensor Imaging Protocol

Acquisition of DTI data in the cervical spinal cord is possible in any modern MR system that is capable of brain DTI. The best results are obtained using reduced field-of-view (FOV) methods which may be known as Reduced FOV EPI, Zoomed EPI, Inner FOV EPI by the manufacturer. While data can be acquired in the sagittal and axial plane most, the WG recommends that data be acquired axially. This provides DTI source data that has concordance to anatomic axial images as well as specific locations on sagittal sequences such that relative mapping of DTI slice locations to the site of injury is most feasible. Axial images offer the additional benefit of isolating specific tracts or quadrants of the spinal cord for sub-selected regions-of-interest.

Table 1 Tier 1 – SCI Diffusion Tensor Imaging Protocol

| Parameter | Option |
| --- | --- |
| Sequence | DTI  (rFOV EPI SE)\* |
| Field Strength | 1.5 or 3 T |
| Orient | Axial\*\* |
| Frame of Reference | Orthogonal vs Rotated |
| Repetition time (TR) (ms) | ≥5500 |
| Echo Time (TE) (ms) | >100 |
| FA (degrees) | 90 |
| Freq (phase) FOV mm | 46(28.4%) |
| Matrix size | 204x58 |
| # slices/  Thickness (mm) (2 Slabs) | 40/6 |
| Slice gap | 0 |
| Voxel size(mm) | 0.8x0.8x6 |
| NEX | 3 |
| Phase Enc. Dir | A to P |
| Fat suppression | yes |
| ≅ Band-width (BW) (Hz/Px) | 742 |
| 2 –dimensional radio frequency (2DRF) Tilt Angle  (degrees) | 20 |
| Flow Comp | no |
| ≅ Echo train length (ETL) | 128 |
| b-values(sec/mm2)  (Directions) | 0 (>1)  /800  (20) |
| ≅Time | 7:30 |

## Proposed Schema for Reporting DTI values

DTI images returned from the scanner can be processed generically to yield a set of cardinal values from each slice using a whole cord region of interest (ROI) (a ROI that encompasses the entire circumference of the spinal cord – including both gray and white matter) or a subselection of a quadrant of the spinal cord that might include tissue predominantly from the anterior, lateral or posterior funiculus (see figure)

Table 2 Proposed Schema for Reporting DTI values

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Slice ref # | Slice location | Anatomic Ref | Selection | Fractional anisotropy FA | Mean diffusivity (MD) | Apparent Diffusion Coefficient (ADC) | RA |
| Integer | Float | Range4 | Whole, 1,2,3,4 | Float | Float | Float | Float |
| Example:3 | 101.4 | C4.2 | Whole | 0.6 | 1.1 | 1.1 | 0.2 |
| Example:4 | 105.4 | C5.1 | 2 | 0.62 | 1.1 | 1.1 | 0.15 |
| Data to be entered by site | Data to be entered by site | Data to be entered by site | Data to be entered by site | Data to be entered by site | Data to be entered by site | Data to be entered by site | Data to be entered by site |

Figure 1 Schema designating location of sub selected ROI from an axial DTI image

