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### 1 MRI Data Acquisition and Analysis Hardware.

#### 2 MRI Acquisition

- 3 The spine generic protocol for T2-weighted (T2w), T2\*-weighted (T2star), and Magnetization
- 4 Transfer (MT) imaging on the GE MR750 3T MRI scanner (GE healthcare Inc, USA) was used
- 5 and it involves specific acquisition parameters as described below<sup>1</sup>.
- 6 For T2w imaging, the protocol uses a sagittal plane with a 3D Cube pulse sequence. Key
- 7 parameters include a repetition time (TR) of 2500 ms, echo time (TE) of 120 ms, and an echo
- 8 train length of 78. The field of view (FOV) is set at 25.6 cm with a slice thickness of 0.8 mm and
- 9 an acquisition matrix of 320x320. The scan utilizes frequency encoding in the superior/inferior
- direction, with an auto shim feature enabled and no phase correction applied.
- 11 For T2star imaging, the protocol is based on a gradient echo (GRE-ME) pulse sequence in an
- oblique plane. The TR is 600 ms, with a flip angle of 30 degrees, and a receiver bandwidth of
- 13 62.50 kHz. The FOV is set to 22.4 cm, with a slice thickness of 5.0 mm and a matrix resolution
- of 448x224. Auto shim is enabled, with no phase correction applied.
- 15 For MT imaging, the protocol includes two sequences: GRE-MT1 and GRE-MT0, both acquired
- in the oblique plane with a spoiled gradient echo (SPGR) sequence. The TR is 35 ms, TE is 4.0
- ms, and the flip angle is set to 9 degrees. The FOV is 17.2 cm, and the slice thickness is 5.0 mm
- with a matrix resolution of 256x256.

### 20 Hardware used in analysis

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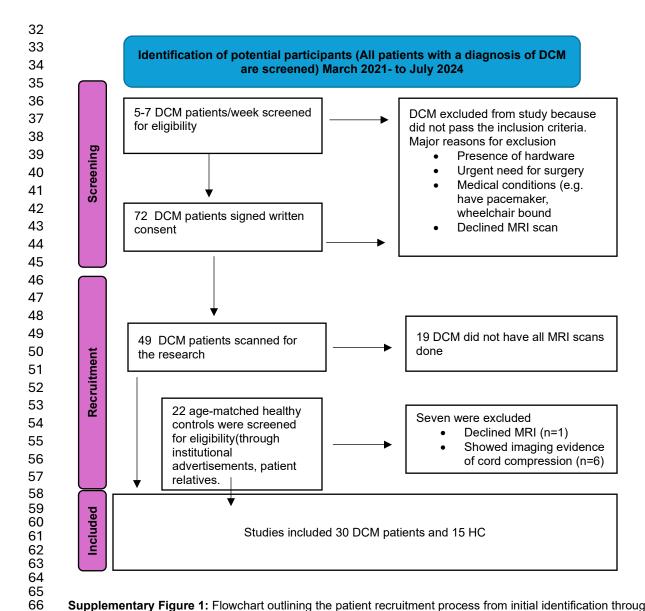
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- 21 Our analysis was conducted on a MacOS Catalina system equipped with a 3.8 GHz 8-core Intel i7
- processor and 64 GB of RAM. The Spinal Cord Toolbox (SCT) was installed following the user-
- 23 friendly instructions available on the Spinal Cord Toolbox website. The SCT-batch pipeline is
- optimized for efficiency and can be executed on standard consumer-grade hardware systems.



**Supplementary Figure 1:** Flowchart outlining the patient recruitment process from initial identification through screening and enrollment.

#### Reference:

1. Cohen-Adad J, Alonso-Ortiz E, Abramovic M, et al. Generic acquisition protocol for quantitative MRI of the spinal cord. *Nat Protoc*. Oct 2021;16(10):4611-4632. doi:10.1038/s41596-021-00588-0