**Clinical Application of Postmortem Magnetic Resonance Imaging in Neonates**

**Sequences protocols:**

The images were acquired on a 3T Ingenia and a 1.5T Achieva scanner (Philips Medical Systems, Best, The Netherlands).

**3T scans:**

DTI was performed with a single-shot, spin-echo echo-planar imaging diffusion sequence in 6 directions with SPIR fat saturation. The DTI parameters were TR/TE = 3,901/90 ms, epi factor=25, SENSE factor=4.0, FOV = 150 mm, acquisition voxel size = 1.6×1.5×2 mm, slice thickness=2 mm, slice gap=0.2 mm with two b-values of 0 and 1000 s/mm2. 34 slices were acquired with one average for a scan time of 3:07 min. Susceptibility-weighted images were acquired with a four-echo sequence with automatic generation of the unwrapped phase images. Other parameters were TR=31 ms, turbo factor=4, SENSE factor=3.0×1.5 (phase×slice), FOV=140 mm, flip angle=620. 77 slices were acquired, in-plane resolution 0.6×0.5mm, thickness 2.0mm with overlap -1.0 mm for a scan time of 0:56 min for one average.

For the anatomic MRI imaging, T1-weighted, FLAIR and 3D T1w images were acquired. The axial T1-weighted TSE scan was obtained with TR/TE = 846/9.3 ms, flip angle= 62°, FOV = 140 mm, turbo factor=4, SENSE factor=1.5, slice thickness = 2 mm with slice gap = 0. 2mm, effective reconstructed voxel size = 0.8×0.7×2.0 mm. 34 slices were obtained with a scan time of 1:52 min with one average. The FLAIR sequence was scanned in the axial direction with TR/TE = 11000/140 ms, TI=2800 ms, FOV = 140 mm, turbo factor=36, SENSE factor=1.2, slice thickness = 2 mm with slice gap = 0. 2mm, effective reconstructed voxel size 0.9×0.9×2.0 mm. 34 slices axial were obtained for a scan time of 1:39 min with one average. The T1w 3D scan was a turbo field echo sequence with TR/TE = 8.2/3.8 ms, TI=1000 ms, flip angle= 8°, FOV = 140 mm, turbo factor=102, SENSE factor=3.0, slice thickness = 1 mm, effective reconstructed voxel size = 1.0×1.0×1.0 mm. 80 slices were obtained for a scan time of 1:31 min with one average.

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| Sequence | Plane | FOV (mm) | TR/TE (ms) | Inversion time (ms) | Flip angle(deg) | Turbo factor | No. of slices | SENSE factor | Voxel size (mm) | Slice width/gap (mm) | NSA | Scan time(min) |
| T1w3D TFE | Axial | 140 | 8.2/3.8 | 1000 | 8 | 102 | 80 | 3.0 | 1.0×1.0×1.0 | --- | 1 | 1:31 |
| FLAIR | Axial | 140 | 11000/140 | 2800 | -- | 36 | 34 | 1.2 | 0.9×0.9×2.0 | 2.0/0.2 | 1 | 1:39 |
| T1w TSE | Axial | 140 | 846/9.3 | --- | 62 | 4 | 34 | 1.5 | 0.8×0.7×2.0 | 2.0/0.2 | 1 | 1:52 |
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Table 1: 3T anatomical sequences

**1.5T scans:**

The DTI was performed with a single-shot, spin-echo echo-planar imaging diffusion sequence in 6 directions with SPIR fat saturation. The DTI parameters were TR/TE = 3659/79 ms, epi factor=47, SENSE factor=2.4, FOV = 211 mm, 26 slices, acquisition voxel size = 2.0×2.0×3.0 mm, slice thickness=3 mm with slice gap=0.3 mm, and two b-values of 0 and 1000 s/mm2. Two averages were acquired for a scan time of 2:01 min. Venous BOLD imaging was performed with a shifted-echo, fast field echo sequence. The parameters were TR/TE=36/51 ms, flip angle= 10°, FOV = 200 mm, SENSE factor=2.7, slice thickness=2.0 mm with overlap of -1.0 mm, and effective reconstructed voxel size of 1.0×0.8×2.0 mm. 130 slices acquired with a scan time of 3:35 min with one average.

For the anatomic MRI imaging, T1-weighted, T2-weighted and FLAIR images were acquired without SENSE parallel imaging.

The T1 weighted image studies were acquired using a classic spin-echo sequence in the axial and coronal planes. The TR/TE was 689/15 ms for the axial scan and 716/15 ms for the coronal acquisition. For both scans the flip angles were 90°, FOV = 180 mm, slice thickness = 3.0 mm, slice gap = 0.3 mm. The effective reconstructive voxel sizes were 1.0×1.0×3.0 and 1.0×1.2×3.0 mm for the axial and coronal scans respectively. The axial and coronal scans were both acquired with one average and with 26 and 27 slices respectively, in scan times of 1:26 min and 1:48 min respectively.

A T2-weighted TSE axial scan was acquired with TR/TE=6176/110 ms, slice thickness = 3.0 mm, slice gap = 0.3 mm, turbo factor=21, FOV=180 mm, and effective reconstructed voxel size = 0.6×0.5×3.0 mm. 28 slices were obtained for a scan time of 1:57 min with two averages. The T2-weighted TSE sagittal scan was acquired with TR/TE=2596/90 ms, slice thickness = 4.0 mm, slice gap = 0.4 mm, turbo factor=24, FOV=180 mm, and effective reconstructed voxel size = 0.7×0.8×3.0 mm. 28 slices were obtained for a scan time of 2:15 min with three averages. An additional axial TSE scan was acquired using SPIR fat suppression. The parameters were TR/TE=5302/90 ms, slice thickness = 4.0 mm, slice gap = 0.5 mm, turbo factor=18, FOV=180 mm, and effective reconstructed voxel size = 0.7×0.7×4.0 mm. 52 slices were obtained for a scan time of 4:57 min with three averages.

The FLAIR sequence was obtained in the axial direction with TR/TE = 7521/120 ms, TI=2400 ms, FOV = 140 mm, turbo factor=40, no SENSE factor, slice thickness = 3 mm, slice gap = 0.3mm, effective reconstructed voxel size = 0.9×0.9×3.0 mm. 26 slices were obtained for a scan time of 2:00 min with two averages.

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| Sequence | Plane | FOV (mm) | TR/TE (ms) | Inversion time (ms) | Flip angle (deg) | Turbo factor | No. of slices | Voxel size (mm) | Slice width/gap (mm) | NSA | Scan time(min) |
| T1-SE | Axial | 140 | 689/15 | --- | 90 | --- | 26 | 1.0×1.0×3.0 | 3.0/0.3 | 1 | 1:26 |
| T1-SE | Coron | 180 | 716/15 | ---- | 90 | --- | 27 | 1.0×1.2×3.0 | 3.0/0.3 | 1 | 1:48 |
| FLAIR | Axial | 180 | 7521/120 | 2400 | 90 | 40 | 26 | 0.9×0.9×3.0 | 3.0/0.3 | 2 | 2:00 |
| T2w TSE SPIR | Axial | 180 | 5302/90 | --- | 90 | 18 | 52 | 0.7×0.7×4.0 | 4.0/0.5 | 3 | 4:57 |
| T2w TSE | Axial | 180 | 6176/110 | --- | 90 | 21 | 28 | 0.6×0.5×3.0 | 3.0/0.3 | 1 | 1:57 |
| T2w TSE | Sag | 200 | 2596/90 | --- | 90 | 24 | 24 | 0.7×0.8×4.0 | 4.0/0.4 | 3 | 2:15 |

Table 2: 1.5T anatomical sequences