Purpose:
The aim of this study was to demonstrate the feasibility of lumbar spinal imaging with 7 Tesla MRI. For this purpose four sequences, which are established at lower magnetic field strengths or assumed to be applicable [1,2], were applied, and different anatomical structures of the lumbar spine were evaluated.

Methods:
Five healthy volunteers and one patient with spina bifida and meningocele received a MRI examination of the lumbar spine with a 7 Tesla whole body scanner (Magnetom 7T, Siemens Healthcare, Germany) and a custom-built 8 channel transmit-receive spine coil [3], including a T2-TSE (TR = 3500, TE = 88, TA = 1.50, FA = 180, voxel size = 0.57 x 0.57), a 3D-DESS (TR = 10.75, TE = 4.01, TA = 5.39, FA = 20, voxel size = 0.78 x 0.78), a 3D-CISS (TR = 5.74 , TE = 2.78, TA = 10.45, FA = 25, voxel size = 1.04 x 1.04) and a 3D-VIBE (TR = 20, TE = 3.06, TA = 12:59, FA = 30, voxel size = 0.57 x 0.57) sequence. Depictability of different anatomical structures and imaging limitations were described.

Results and Discussion:
A combination of CISS and VIBE sequences provides visualization of the vertebrae, the intervertebral discs, the bony neural foramina, the facet joints, the dural sac, and the intraspinal portions of the spinal nerves (Fig. 1 a&b). Furthermore bony malformations and the meningocele in the patient could be well depicted with these sequences (Fig. 3). The T2-TSE suffered from severe loss of signal homogeneity in most of the volunteers depending on the thickness of the subcutaneous fat tissue (Fig. 2 b). DESS provided only little contrast between spinal nerves and CSF, the contrast between vertebrae and discs was inferior to the CISS and the VIBE (Fig. 2 a). Differentiation of intraforaminal structures was difficult with all mentioned sequences.

Conclusion:
These preliminary results indicate that bony spine and dural sac anatomy in healthy volunteers, as well as complex spinal malformations can be visualized with 7 Tesla MRI. However this study provides an important basis for further clinical applications in the spine at 7 Tesla.

References: