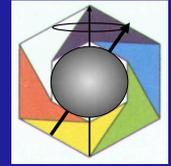




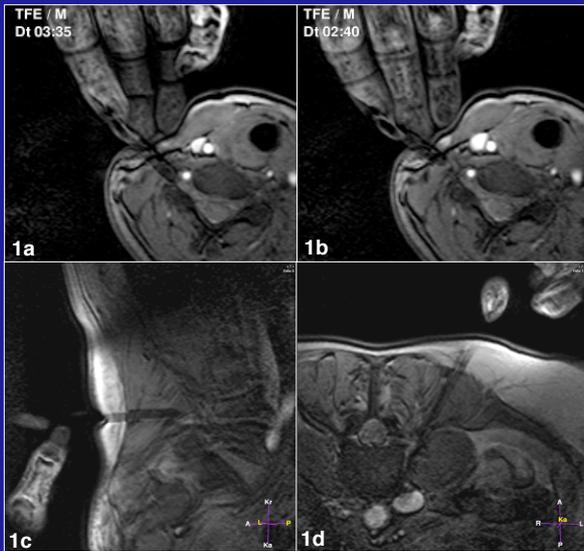
# Back Pain Treatment Using Real-time MR-Fluoroscopic Guidance of Periradicular Infiltration



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**Purpose:** To evaluate the use and clinical effectiveness of facette joint and periradicular infiltrations using a closed bore magnetic resonance system for the direct guidance of punctures.

**Material and method:** Our MR-system (Philips 1.5T ACS/NT) was additionally equipped with a mobile in-room monitor, a start pedal and a dock-on table. Round open surface coils with inner diameters between 7, 9 and 15 cm were used for signal detection. Imaging during the procedures was done using a single slice turbo gradient echo sequence (TR 6.0, TE 1.6, flip 20°, matrix 192x256, acquisition time 1sec.).



**Figure 1a and b:** Series of single slice turbo gradient echo sequence (TR 6.0, TE 1.6, flip 20°, matrix 192x256, acquisition time 1sec.) maintained during periradicular infiltration at the cervical spine. 1c and d: The same sequences at lumbar spine (sagittal c, axial d).

We performed 188 facette joint and/or periradicular infiltrations (Fig. 1) with local anesthesia (1ml Mepivacain HCl 1%) and a corticoid (1 to 2ml Betamethason) in 139 patients. The therapeutic outcome of 143 interventions of the spine (88 males/55 females; mean age 51.9 years (21-85years) was evaluated using a visual analogue scale for intensity of pain and restricted mobility before (n=143), right after (n=143), two weeks (n=142), two months (n=129) and six months (n=80) after intervention.

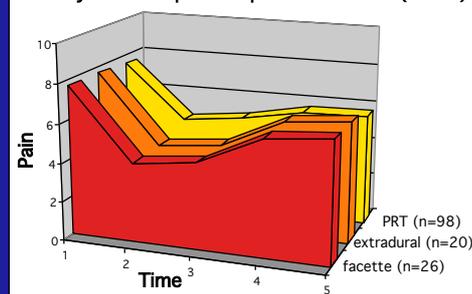
Interventions performed	
<i>Cervical spine</i>	
Facette joint	5 (m/f: 2/3)
Periradicular	41 (m/f: 21/20)
<i>Thoracic spine</i>	
Facette joint	2 (m/f: 1/1)
<i>Lumbar spine</i>	
Facette joint	19 (m/f: 14/5)
Periradicular	57 (m/f: 38/19)
Intraspinal epidural	19 (m/f: 9/11)
<b>TOTAL</b>	<b>143 (m/f: 88/55)</b>

In order to evaluate prognostic factors the groups of each spinal level were divided into responders (decrease of pain of at least two scale steps) and non-responders (decrease of pain of less than two steps) right after and two weeks after the procedure (Fig. 3).

**Results:** MR allowed for the direct visualization of all manipulations during punctures and all interventions were well supported by our patients. Based on the fact of the good general outcome right after and two weeks after intervention (Fig. 2), cervical and lumbar interventions were divided into responders and non-responders (Fig. 3). At the level of the cervical spine responders and non-responders

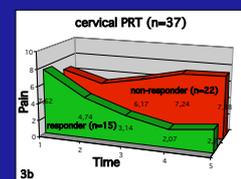
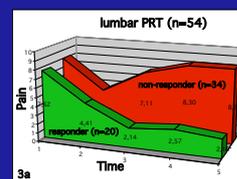
showed a similar mean age (52.9 and 51.8 respectively). 80% of responders suffered from radicular pain and 66% showed narrowing of the neuroforamen. Only 50% of nonresponders had radicular pain and 45% showed narrowing of the neuroforamen. 80% of the responders were males whereas 68% of nonresponders were females. At the level of the lumbar spine, responders are slightly older than the non-responders (58.1y, 52.7y respectively). 85% of responders vs. 76% of non-responders had circumscribed radicular pain. Additional diagnoses of tumors (ovarian cancer), metabolic disorders (diabetes) and previous lumbar spine surgery (38%) were more frequent in non-responders than in responders (15% after lumbar spine surgery).

**Summary of follow-ups of all spinal interventions (n=143)**



**Figure 2:** 6 months follow-up of back pain of treated patients: 1=before, 2=right after, 3=2 weeks, 4=2 months, 5= 6 months following intervention. Note the marked decrease of back pain right after and two weeks after interventions.

**Discussion:** The main reasons to use MR for interventional procedures are the pseudo-fluoroscopic effect with direct visualization of the manipulated device, the free selection of the direction of access and the angulation of control scans, the excellent tissue differentiation, the absence of X-ray exposure and the cut-down of intervention time by 20 to 30 % as compared to CT. Also, there is no necessity to use any steering devices because the operators' fingers with the artefact caused by the instrument are readily seen during the procedure (Fig. 1a-d). Looking at the results of 26 facette joint and 114 periradicular infiltrations, a rather good general outcome is perceived in the first 2 weeks after intervention (Fig. 2). Responders with an initial decrease of back pain more than two scale steps right after and two weeks after intervention show good long term results (Fig. 3). Age has no prognostic relevance. The better the clinical workup for radicular pain the better is the therapeutic outcome of periradicular infiltration. Even non-responders showed an initial decrease of back pain right after MR-guided periradicular infiltration (Fig. 3). This may be a suited additional means for the management of the acute phase of chronic back pain. Underlying systemic disease such as metabolic disorders or neoplasms have a non favourable prognosis. But one case of plasmocytoma showed that even under such conditions, good long term outcomes may occur.



**Figure 3a and b:** 6 months follow-up of back pain of treated patients: 1=before, 2=right after, 3=2 weeks, 4=2 months, 5= 6 months following intervention. Responders (back pain decrease at least 2 scale steps right after and two weeks after the procedure) showed significant better long term outcome.

**Conclusions:** Short magnet close bore MR-systems are well suited for interventional procedures at any level of the spine with all advantages of high field scanner, i.e. good signal to noise with short imaging times. A first clinical outcome analysis shows quite promising results. An important prognostic factor is the presence of radicular symptoms. Age and systemic diseases are bad prognostic factors. MR-guided periradicular infiltration may be a suited additional facility to manage acute phase of chronic back pain.