Comparison of MultiHance® and Gadovist® for Cerebral MR Perfusion Imaging

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Purpose
Perfusion measurements of the brain by contrast-enhanced MR imaging is becoming more and more popular. The method has already proven effective for the assessment of cerebrovascular diseases, for brain tumors, and for monitoring after radiotherapy. A crucial aspect for the quality of the perfusion measurements and the reliability of the results is the amount of the relative signal reduction, which is dependent on the concentration and the relaxivity of the contrast agent used. The present study was conducted to evaluate two of the newer generation contrast agents for cerebral perfusion MR imaging. Specifically, the weakly protein interacting MR contrast agent MultiHance® was compared with the one-molar agent Gadovist® at single (0.1 mmol/kg) and double (0.2 mmol/kg) dose in both healthy volunteers and patient subjects.

Materials & Methods
A randomized intraindividual comparative study was conducted in 12 healthy male volunteers. The imaging parameters, slice positioning and contrast media application were standardized. For the quantitative assessment the rCBV and rCBF of gray and white matter, the percentage signal drop, and the full width half maximum (FWHM) of ROI signal time curves were calculated. For a qualitative analysis the image quality of the rCBV and rCBF maps in respect of delineation of gray and white matter clinical utility, were evaluated in an independent off-site assessment. An equivalent study in patients with cerebral gliomas is currently ongoing and initial results will be presented.

Results
On-site evaluation of the study in healthy volunteers revealed that single doses of the new contrast agents were sufficient to achieve high quality perfusion maps. No differences in susceptibility effect, described by the percentage of signal loss, were apparent between the two contrast agents (Table 1). The FWHM was equal for the single dose of both agents and the double dose of Gadovist®. Only the double dose of MultiHance® led to a significant widening of the signal time curve (p < 0.05). The calculated rCBV and rCBF values of the different ROIs were constant for both dosages and contrast media. In a
qualitative off-site assessment both readers found the double dose images to be better suited to gray-white matter differentiation, however, there was no difference between the contrast agents and single dosage offered good image quality in the majority of exams.

Table 1: Percentage signal drop as a marker for the susceptibility effect

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<tr>
<th></th>
<th>MultiHance®</th>
<th>Gadovist®</th>
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<tbody>
<tr>
<td></td>
<td>Single Dose</td>
<td>Double Dose</td>
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<tr>
<td>Mean</td>
<td>28.3</td>
<td>39.3</td>
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<tr>
<td>SD</td>
<td>5.6</td>
<td>5.1</td>
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<tr>
<td>p-value*</td>
<td>p = 0.0005</td>
<td>p = 0.0005</td>
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* Wilcoxon signed rank test

**Conclusion**

The susceptibility effect of the new generation contrast agents is stronger than for conventional MR contrast media. The one molar MR contrast agent Gadovist® has no advantages over MultiHance®, an MR contrast agent with a higher relaxivity in perfusion MR imaging. Both agents allow the calculation of high quality perfusion maps at a lower contrast agent dosage.

The authors of this work have indicated that they will be discussing/presenting MultiHance and Gadovist for perfusion MR imaging. These products are made by Bracco-Byk Gulden/Germany.

The authors of this work have indicated the following affiliations/disclosures: Bracco, Employee.