

Diagnostic Accuracy of Contrast-enhanced MR Angiography with Various Doses of Gadobenate Dimeglumine

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Purpose: Gadobenate dimeglumine produces greater enhancement than other gadolinium agents on T1 weighted images due to a transient interaction with serum proteins. This study was performed to determine the accuracy of contrast-enhanced MR angiography (CE-MRA) with gadobenate dimeglumine for detection of clinically significant steno-occlusive disease versus digital subtraction angiography (DSA) and to identify the appropriate dose of gadobenate dimeglumine for this application.

Methods: 84 patients with suspected disease of the renal (n=16), pelvic (n=41) or carotid (n=27) arteries underwent DSA and CE-MRA (3D-spoiled gradient-echo sequences at 1.5 T) performed with gadobenate dimeglumine (MultiHance, Bracco) at doses of 0.025, 0.05, 0.1 or 0.2 mmol/kg (21, 25, 17 and 21 patients, respectively). Three blinded readers evaluated MRA images while one blinded reviewer evaluated DSA studies. Detection and grading of stenoses and evaluation of inter-reader agreement were performed qualitatively on a segmental basis. Sensitivity, specificity, and accuracy of CE-MRA for detection of significant disease (>50% stenosis/ occlusion for renal and pelvic arteries; >70% stenosis/occlusion for carotid arteries) were calculated by segmental matching of MRA and DSA findings. Findings were compared to DSA using McNemar's or Chi-square tests.

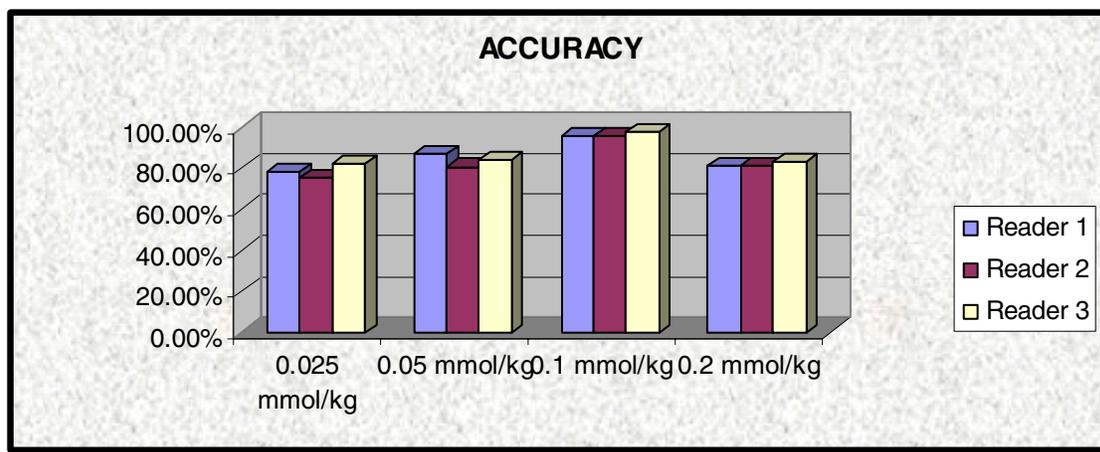


Figure 1: Accuracy of CE-MRA vs. DSA for all readers and doses

Results: Significant disease was present in 103 vessels at DSA and 103 vessels at CE-MRA: 27, 34, 19 and 23 vessels at 0.025, 0.05, 0.1 and 0.2 mmol/kg doses, respectively. Values for sensitivity for the 3 readers ranged from 44.4-70.4% following the 0.025/mmol/kg dose, from 55.9-67.6% following 0.05/mmol/kg, 84.2% following 0.1/mmol/kg (all three readers), and from 65.2-69.6% following 0.2/mmol/kg. Specificity ranged from 78.2-90.3% following 0.025/mmol/kg, 83.3-91.3% following 0.05/mmol/kg, 96.9-99.2% following 0.1/mmol/kg, and 83.8-86.5% following 0.2/mmol/kg. Accuracy was high in all dose group (range 75.5-97.3%), but was highest in the 0.1 mmol/kg dose group (95.2%, 95.2%, and 97.3% for readers 1, 2, and 3 respectively). The differences in accuracy between the 0.1 mmol/kg dose and each of the other 3 doses was statistically significant across all readers ($p < 0.01$) (Fig 1). Inter-reader agreement was good with all 3 readers agreeing in over 74.6-85.7% of all segments. The highest agreement (85.7%) for detecting clinically significant steno-occlusive disease was achieved with CE-MRA in the 0.1-mmol/kg group

Conclusions: Significantly better diagnostic performance and inter-reader agreement for detecting clinically significant steno-occlusive disease of the renal, pelvic and carotid arteries was achieved with a gadobenate dimeglumine at a dose of 0.1 compared to doses of 0.025, 0.05 and 0.2 mmol/kg.