



Title	Interventional and Intraoperative Magnetic Resonance Imaging
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Aim

To overview the safety, efficacy/effectiveness, cost, and utilization of real-time magnetic resonance imaging (MRI) during interventional and surgical procedures in Canada.

Conclusions and results

Only 4 nonrandomized, comparative studies met the inclusion criteria (1 on interventional MRI, 3 on intraoperative MRI). Postoperative morbidity rates were similar for interventional MRI-guided brain biopsy and conventional stereotactic methods. One death followed stereotactic biopsy, but no deaths occurred in the interventional MRI group. Intraoperative MRI in monitoring brain tumor resection substantially increased operative time compared to conventional surgery, with no discernible effect on perioperative anesthetic outcome. Conversely, the hospital stay was generally shorter after intraoperative MRI. Intraoperative MRI in resection control of supratentorial cavernous hemangiomas did not affect the amount of pathology resected, compared to standard neuronavigation methods. Significantly more tumor volume was resected in patients with high-grade gliomas. No studies reported adverse events directly related to intraoperative MRI, or to the conventional procedures that intraoperative MRI was compared to. Due to confounding from the learning curve effect, the results may underestimate the capabilities of interventional/intraoperative (I/I) MRI, but methodological flaws in the studies obscured the overall magnitude or direction of this bias. It is unclear whether the equivocal results are a consequence of limitations in study design, the I/I MRI procedure itself, or both. Canada has 4 I/I MRI facilities, and 2 additional centers may soon acquire I/I units.

Recommendations

Interventional and intraoperative MRI is a high-cost, developmental technology. No major safety concerns have been identified. Due to its recent genesis, the scope, applicability, efficacy, and cost effectiveness of this tech-

nology have not been established.

Methods

All original, published, randomized controlled trials and nonrandomized comparative studies, with at least 10 patients in each study arm, were identified by systematically searching (Jan 1990 to Jan 2004) PubMed, EMBASE, HealthStar, the Cochrane Library, Science Citation Index, and the websites of various health technology assessment agencies, research registers, and guideline sites. No language restriction was applied. Only studies of interventional or surgical procedures that utilized near real-time MRI to guide or monitor aspects of the procedure at the time it was being performed were included.

Further research/reviews required

The included studies used MRI only as a tool to guide or monitor interventional and operative neurosurgical procedures. Hence, the clinical utility of MRI to guide or monitor other interventions, eg, percutaneous biopsy or endoscopic abdominal surgery, is unknown. Concurrently controlled studies assessing the effect of I/I MRI on patient management and outcomes will provide the information on whether I/I MRI has broader clinical applications.