Background: Concerns over radiation exposure with paranasal sinus computed tomography (CT) have recently evolved. Magnetic resonance imaging (MRI) may be more advantageous in this regard, but the diagnostic performance of MRI in chronic rhinosinusitis has not been reported.

Objectives: Determine the correlation between CT and MRI based staging and diagnosis of chronic rhinosinusitis.

Methods: Paired CT and MRI images of 89 adult patients who were imaged by both modalities within a 3-month time period for evaluation of purulent disease were scored for sinus disease using the Lund-Mackay system in both a randomized and blinded fashion. The Lund scores were compared for similarity, correlation and diagnostic classification between modalities.

Results: The mean Lund CT scores were 2.3 ± 0.6 (95% CI) for CT-based staging and 2.1 ± 0.5 (95% CI) for MRI-based staging with a median time interval between scans of 3 days. The difference in means was not statistically significant (p=0.444, paired t-test). Correlation analysis revealed a significant association between CT and MRI based scores (Pearson’s r=0.887, p<0.001). Disease classification agreement analysis using published Lund score cutoffs (3 versus 4) for the likelihood of true sinus disease revealed that CT and MRI based scoring agreed on 76 cases (85.4%). Disagreement occurred in 13 cases (kappa 0.557, p<0.001). Sensitivity, specificity, positive predictive value and negative predictive value were 66.7%, 90.1%, 63.2% and 91.4%, respectively.

Conclusions: Lund-Mackay staging of sinus disease by MRI is closely correlated to corresponding staging based on CT. MRI does not significantly over-stage or under-classify patients with sinus disease.

INTRODUCTION

• Paranasal sinus imaging serves an important diagnostic role by providing more objective evidence of sinusosal disease, oftentimes completing the evaluation of the patient with suspected rhinosinusitis.

• The cost, availability and efficiency of CT has made it the gold standard test in the diagnosis of chronic rhinosinusitis (CRS).

• Much attention has recently been drawn to the long-term effects of the radiation associated with CT scans.

• In a recent study, researchers calculated estimates of the lifetime risk of death from radiogenic cancer attributable to CT scans, declaring the direct link between CT scans and an increased risk of cancer as “very convincing”. They propose physicians consider replacing CT use, when practical, with magnetic resonance imaging (MRI).

• If sinusonal MRI is to be considered as a diagnostic tool in the evaluation of CRS, its accuracy and feasibility need to be determined. Accordingly we sought to directly compare the ability of MRI to diagnose and stage sinusonal disease with that of CT.

METHODS

• Adult patients with known or suspected purulent disease who were imaged by both CT and MRI were selected from a radiological database for inclusion in the study.

• Images were presented to the evaluator in an unpaired, blind and randomized fashion and reviewed for mucosal thickening and opacification of each sinus group according to the Lund-Mackay grading system.

• Scores were then compared for similarity in Lund score, correlation of Lund score and diagnostic classification between the two modalities using the paired Student’s t-test, Pearson correlation and kappa analysis with statistical significance set at p<0.05.

RESULTS

Table and Figure 1: Mean score and box plot distribution of the Lund scores for CT scans versus MRI of the paranasal sinuses. The difference in mean Lund scores was not statistically significant.

• Disease classification agreement analysis using Lund score cutoffs (Lund > 4 representing disease) for the likelihood of true disease revealed that CT- and MRI-based scoring agreed on 76 cases (85.4%).

• Disagreement in disease classification between CT and MRI occurred in 13 cases (7 MRI positive but CT negative and 6 CT positive but MRI negative) yielding a kappa value of 0.557 (p<0.001).

• Sensitivity, specificity, positive predictive value and negative predictive value for MRI in the diagnosis of true CRS with CT as the gold standard were 66.7%, 90.1%, 63.2% and 91.4%, respectively.

DISCUSSION

• If MRI is to be considered a substitute for CT, its ability to assess disease must be examined. In prior studies on CRS, MRI has been shown to play a potentially important supplementary role in some cases of CRS.

• The current data provide new evidence supporting the ability of MRI to accurately stage and diagnose sinonosal disease when compared to that of CT.

• MRI may represent an alternative method of radiological evaluation of rhinosinusitis in the setting of medical therapy and allow physicians to obtain more frequent, serial imaging to document the dynamic course of the disease and spare patients from repeated radiation exposures.

• The specificity and negative predictive value data suggests that MRI is particularly good in excluding sinus disease when true sinus disease is not present.

• However, MRI lacks the capacity to effectively evaluate bony anatomy, which would likely have more of an impact on surgical planning for CRS.

• Given that rhinosinusitis is diagnosed by a wide variety of care providers and that diagnostic imaging is obtained more frequently than surgical imaging, MRI could still establish a role in the diagnosis and medical management of rhinosinusitis.

• Clinicians must now consider the effects of CT-associated radiation when deciding among imaging modalities, and MRI may be a reasonable alternative for many clinical scenarios.

• The current study supports the ability of MRI to accurately evaluate sinonosal disease when compared to the gold-standard of CT, particularly in its ability to exclude sinus disease when not radiographically present.

• Further studies should be directed at providing additional insight into the utility of MRI in the staging of patients with known active sinonosal disease.

REFERENCES


