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Title - ASSESSMENT OF DISEASE ACTIVITY USING CONTRAST-ENHANCED MAGNETIC RESONANCE IMAGING IN CHILDREN AND YOUNG PEOPLE WITH SUSPECTED HIP ARTHRITIS – CAN WE DO BETTER?

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Background

Contrast enhanced magnetic resonance imaging (CE-MRI) is an important aid in identifying early arthritis, especially when the hip joint is involved. Improved outcomes follow early diagnosis and treatment. Radiologists must therefore differentiate normal scans from subtle signs of early inflammation. Previous re-evaluation of hip CE-MRI scans at our institution found discrepancies in interpretation between radiologists. The aims of this study were: firstly to construct and pilot a grading tool to improve the assessment of disease activity from hip CE-MRI scans. And secondly to assess the reliability of the developed grading tool.

Methods

A retrospective cohort study was conducted of patients who underwent hip CE-MRI between January 2011 and September 2014. Three musculoskeletal radiologists independently assessed all scans using a standardised reporting tool comprised of: effusion, synovial enhancement, marrow oedema, synovial thickness and visual analysis of synovium. Reliability tests used Cohens kappa (κ) for categorical variables and Intra-class Correlation Coefficient (ICC) for continuous variables.

Results

Eighty patients were included. Overall the presence of a joint effusion and marrow oedema had the highest inter and intra-observer reliabilities. Synovial thickening (whether by visual assessment or measurement) and enhancement were unreliable signs. Furthermore, there was a large amount of missing data for the thickness measurements, attributable to difficulties in measurement. Inter-reader comparison was moderate for effusion (k=0.5-0.7) and marrow oedema (k=0.4-0.6) and poor for synovial enhancement (k=0.06-0.3). Visual synovial assessment had moderate reliability (k=0.4-0.5) whereas measurement was poor (ICC= 0.09- 0.3). Table 1 shows the full reliability results.

Conclusions

    Measuring synovium was unreliable and impractical demonstrating demand for an alternative method.
    Radiologist reporting was inconsistent between and within readers.
    We would recommend that Reporting of CE-MRI hip scans should reflect the level of certainty to aid clinical decision-making.

Reliability	Variable					
	Effusion	Marrow Oedema	Synovial enhancement	Axial thickness	Coronal thickness	Visual impression of synovium
Inter-reader						
1 vs 2	0.514k p<0.001	0.567k p<0.001	0.058k p=0.015	0.267 ICC p=0.006	0.101 ICC p=0.129	0.381k p<0.001
1 vs 3	0.579k p<0.001	0.403k p<0.001	0.035k p=0.062	0.305 ICC p<0.001	0.297 ICC p=0.147	0.435k p<0.001
2 vs 3	0.693k p<0.001	0.587k p<0.001	0.336k p<0.001	0.319 ICC p<0.001	0.092 ICC p=0.012	0.526k p<0.001
Intra-reader						
1	0.353k p=0.003	0.625k p<0.001	-0.940k p=0.548	0.266 ICC p=0.079	0.691 ICC p<0.001	0.390k p=0.008
2	0.692k p<0.001	0.684k p<0.001	0.709k p<0.001	0.201 ICC p=0.206	0.065 ICC p=0.369	0.908k p<0.001
3	0.610k p<0.001	0.643k p<0.001	0.805k p<0.001	0.441 ICC p=0.008	-0.132 ICC P=0.745	0.610k p<0.001

Table 1- Inter and Intra-reader reliability across CE-MRI parameters.

ICC= Intra class correlation coefficient, k = Cohens kappa. 95% level of significance (p<0.05). Using Fleiss's interpretation Poor reliability is k<0.4, moderate k >0.4 but <0.75, excellent k>0.75