Concise Report

Clinical assessment and core outcome variables are poor predictors of hip arthritis diagnosed by MRI in juvenile idiopathic arthritis

K. Nistala, J. Babar, K. Johnson, P. Campbell-Stokes, K. Foster, C. Ryder and J. E. McDonagh

Objectives. To compare the diagnostic performance of clinical assessment against magnetic resonance imaging (MRI) diagnosed hip arthritis in a juvenile idiopathic arthritis (JIA) population. To determine the clinical and serological predictors of MRI diagnosed hip arthritis.

Methods. A total of 34 JIA patients with established disease (mean disease duration 6.3 yrs) had their hip MRIs scored for features of active hip arthritis and hip damage. Results were compared with clinical variables (disease subtype, history of hip pain, core outcome variables (COV)) and the clinician’s assessment of active hip arthritis.

Results. MRI features of active hip arthritis were found in 45 hips (70%) and hip damage in 36 hips (56%). Clinical assessment had fair agreement with MRI scoring of active arthritis in patients with disease duration <4 yrs (κ score 0.38, P = 0.045). Clinical assessment had a sensitivity of 25.7% and specificity of 91% for detecting MRI diagnosed arthritis. Of the core outcome variables only erythrocyte sedimentation rate predicted inflammation detected on MRI (r = 0.44, P = 0.014).

Conclusions. The association between the clinician’s assessment, core outcome variables and MRI findings in this study was limited. This indicates that clinical and laboratory findings are inadequate diagnostic tools for the assessment of hip arthritis when compared with MRI as the gold standard.

KEY WORDS: Coxitis, Magnetic resonance imaging, Juvenile idiopathic arthritis, Hip joint, Clinical examination.

Introduction

Hip involvement in juvenile idiopathic arthritis (JIA) is common [1] and is a cause of significant functional impairment [2]. Long-term follow-up shows that total hip replacements are carried out in 26–44% of JIA patients, most commonly within the first 10 yrs of disease [3]. The development of hip arthritis (coxitis) is likely to be an indication for treatment with disease modifying agents, such as methotrexate and anti-tumour necrosis factor (TNF) agents. In some cases, injection of intra-articular steroids to the hip can bring about prolonged remission [4]. Unfortunately, the clinical detection of coxitis is difficult as inflamed synovium cannot be directly palpated. As a result, subclinical coxitis can lead to joint damage [5].

For the purposes of classification, coxitis is defined clinically as ‘restricted movements with joint pain’ [6], but these clinical features are not specific for active inflammation and may occur with previous joint damage. Ultrasound is often used to assist the diagnosis by confirming the presence of an effusion, but it remains less sensitive than contrast enhanced MRI in detecting features of active arthritis [7]. It is impractical to perform MRIs in all children and young people with JIA as there are issues of cost, availability and the need for sedation. So it is important to know the clinical context in which MRI is most likely to be useful.

We hypothesized that clinical assessment would be poor at detecting coxitis in patients with co-existing hip damage. To test our hypothesis we compared the clinician’s clinical assessment with MRI as the gold standard for active hip disease in a cohort of patients with established JIA.

Methods

We retrospectively reviewed the last 50 hip MRI scans requested on children and young people with JIA at our institution from 9 June 2003 to 25 January 2005. Eligibility criteria for patients included a diagnosis of JIA as defined by the revised International league of Associations for Rheumatology criteria [6] and disease duration >6 months. Symptoms of hip pain and the clinician’s assessment of hip arthritis (active, inactive or unsure), active joint count, demographic data and erythrocyte sedimentation rate (ESR) were collected from case notes. Core outcome variables (COV) are routinely recorded for every patient at every clinic visit and include the marking of the active and restricted joints on a skeletal diagram. COV [8] included physician’s global assessment of hip arthritis (active, inactive or unsure), active joint count, demographic data and erythrocyte sedimentation rate (ESR) were collected from case notes. Core outcome variables (COV) are routinely recorded for every patient at every clinic visit and include the marking of the active and restricted joints on a skeletal diagram. COV [8] included physician’s global assessment of hip arthritis (active, inactive or unsure), active joint count, demographic data and erythrocyte sedimentation rate (ESR) were collected from case notes. Core outcome variables (COV) are routinely recorded for every patient at every clinic visit and include the marking of the active and restricted joints on a skeletal diagram. COV [8] included physician’s global assessment of hip arthritis (active, inactive or unsure), active joint count, demographic data and erythrocyte sedimentation rate (ESR) were collected from case notes. Core outcome variables (COV) are routinely recorded for every patient at every clinic visit and include the marking of the active and restricted joints on a skeletal diagram. COV [8] included physician’s global assessment of hip arthritis (active, inactive or unsure), active joint count, demographic data and erythrocyte sedimentation rate (ESR) were collected from case notes.
MRI activity for each hip was scored as 1 point each for bone oedema, enhancing synovium, effusion, maximum score ¼ 3. Each triangle represents one hip. Filled triangles have evidence of damage on MRI (MRI damage scores >0). Horizontal lines represent mean MRI activity score.

MRI examination

Hipp effusions and synovial enhancement were present more often than bone oedema (36, 33 and 15%, respectively). Of all hips scanned, 30% had no MRI features of disease activity, and 15% scored 3 points. Of all hips, 44% had no evidence of damage, and 28% scored 3. None of the patients had MRI features of acetabular protrusion. MRI activity and damage scores did not correlate. There was substantial inter-observer agreement for individual aspects of the activity and damage scoring systems (k = 0.76–1.0).

Comparison of MRI findings and clinician’s assessment

There was a limited relationship between clinician’s assessment and MRI activity score (Fig. 1). MRI activity scores were higher in patients thought to have clinically active hips vs inactive although this did not achieve statistical significance (1.9 vs 1.2, P = 0.066). Agreement between MRI activity and clinical assessment was fair in cases with arthritis less than 4 years from diagnosis (k score 0.38, P = 0.045). There was no agreement in longer standing disease (k score 0.02, P = 0.62).

We analysed the agreement between clinical assessment and MRI activity score according the severity of damage. Concordance between clinician and MRI result was highest in undamaged hips with agreement in 11 out of 18 cases. This worsened with increasing damage score (k trend = 0.18, 1 df, P = 0.023) and in hips with a damage score of 3, there was agreement in only 4 of 16 cases.

If cases where the clinician was unsure are excluded, clinical examination has a sensitivity of 25.7% and specificity of 91% for detecting MRI-diagnosed arthritis.

Predictors of MRI activity score

COV, history of pain, disease subtype and duration of arthritis were compared with total MRI activity scores using multiple regression to assess their predictive value. In exploratory univariate analyses, only ESR had significant correlation with MRI scores (r = 0.44, P = 0.014, Fig. 2). Physician’s global assessment and hip pain were associated with MRI activity score (P = -0.37 and 0.2, respectively) and using a cutoff of P < 0.2 these were selected for inclusion into standard multiple regression analysis. However, the latter two variables did not make a statistically significant contribution to a model based on ESR alone. A receiver operator curve was used to select an optimal cutoff as ESR >7 that predicts hip arthritis on MRI with a sensitivity of 72% and specificity of 80%.
Discussion

Over the last decade, there has been an increasing move towards earlier and more aggressive treatment of JIA with methotrexate and biological agents in the hope of preventing joint damage [14]. In the context of coxitis, decisions to escalate treatment may be limited because of the difficulties in confirming arthritis by clinical examination. In our study, we have shown that the clinician’s assessment of active hip arthritis has only fair agreement with MRI-based diagnosis and this is limited to early disease. Clinicians misjudged coxitis on MRI when hips were more damaged and in particular underestimated MRI features of inflammation. We found that damage worsened with disease duration and this may account for the poor concordance between doctor and MRI results in patients with long-standing disease. It is possible that clinicians are incorrectly attributing their clinical findings of pain and restriction to pre-existing bony damage rather than disease activity. In contrast, clinicians were invariably correct in labelling hips without inflammation on MRI as inactive, as evidenced by the high specificity for clinician’s assessment.

Recognizing the limitations of clinical examination, we questioned if other clinical or core outcome variables would better predict MRI changes. Our data from JIA patients with established disease suggests that from COV only ESR is predictive of active hip arthritis on MRI. Taken from a clinical perspective a highly elevated ESR is specific for hip inflammation, but a normal ESR does not exclude coxitis on MRI. MRI scores did not differ significantly between disease subtypes, but patients with systemic JIA had the highest mean scores, consistent with reported results by Argyropoulou et al. [11].

The MRI features of hip disease in JIA have been reported [10, 11] but not standardized and do not currently play a role in the diagnostic criteria for JIA [6]. Our study piloted a scoring system for disease activity and damage on hip MRI that showed very good levels of inter-observer agreement. Damage and activity scores were independent suggesting that separate disease characteristics were being assessed. Our study did not include a healthy control group. Although normative data on paediatric hip MRI is available [15, 16], formal validation of a scoring system will require control subjects to ensure that MR abnormalities are not being over-called.

Our study has the weakness of being a retrospective review although standardized clinical data recording systems mitigate against some of these flaws. The numbers scanned are small and are biased by being a cohort selected for MRI on clinical grounds and are, therefore, at increased risk of coxitis. The results may not be applicable to all JIA patients particularly those with less aggressive disease. Our findings of inflammation on hip MRI in the absence of clinical signs, are likely to reflect the high sensitivity of MRI, and are consistent with results from MRI of knee arthritis [17]. However, it is difficult to make treatment recommendations on MR findings alone as the long-term significance of these abnormalities is still unclear. Similar difficulties are faced in the MRI of sacroiliitis in ankylosing spondylitis (AS) [18]. In AS, there is evidence that juxta-articular bony inflammation can be suppressed with anti-TNF agents [19] and prospective studies are underway to see if this favourably influences long-term outcome. Finally, as the use of MRI remains constrained by cost and the need for sedation in the paediatric age group, comparisons between MRI and more sensitive ultrasound techniques such as power Doppler would be important in the future.

In conclusion we have reported pilot data that show that clinical assessment of active hip arthritis has a limited relationship with MRI features of inflammation, particularly when there is co-existent damage. Of core outcome variables only ESR is of value in predicting MRI results. Our results highlight the contribution of MRI when there is clinical uncertainty between active and damaged hips. A prospective cohort study is now planned that will facilitate the formal validation of the scoring system for hip MRI abnormalities in JIA detailed here.

Acknowledgements

J.E.McD. is an ARC funded Clinical Senior Lecturer in Paediatric and Adolescent Rheumatology (www.arc.org.uk). P.C.S. is funded by the New Zealand Arthritis Foundation. The authors are indebted to the clinical staff in the paediatric rheumatology department for data collection and Carole Cummins (Birmingham Children’s Hospital) and Tim Cole (Institute of Child Health, London) for statistical advice.

The authors have declared no conflicts of interest.

References