Medical Xpress

New imaging technique may help identify joint inflammation in children earlier

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The results of a study presented today at the Annual European Congress of Rheumatology (EULAR) 2017 have confirmed that fluorescence optical imaging (FOI), a technique used to visualise inflammation in arthritic joints, is as effective as ultrasound with power doppler (US/PD) at monitoring response to treatment in juvenile idiopathic arthritis (JIA). FOI was also found to be more effective than US/PD at detecting inflammation in the absence of symptoms and signs.1

To a certain degree, US/PD is acknowledged to be operator dependent and potentially limited in visualising very detailed inflammatory changes, such as altered blood flow in tiny blood vessels and / or capillary leakage, especially in very small finger joints. In contrast, FOI may provide greater information on the microcirculation in these joints. Also, FOI is a time-efficient and operator-independent imaging modality, which can be performed by nurses or other non-medically qualified personnel.2

"Accurate detection of inflamed joints is essential both to guide treatment decisions and to assess treatment efficacy in patients with JIA," said lead author Professor Gerd Horneff, from the Asklepios Children's Clinic, Sankt Augustin, Germany. "FOI may be used in clinical practice to accurately identify joint inflammation earlier and with greater confidence. It should be particularly useful in identifying those children with clinically non-apparent joint inflammation of the hands and/or wrists who need to start on anti-rheumatic drug treatment," he said.

In this study, out of 37 patients with polyarticular JIA, 24 were started on methotrexate and 13 on a biologic for the first time (11 on etanercept, 1 on adalimumab and tocilizumab respectively).

Clinical examination showed an effective response to these treatments with the percentage of affected joints in the hand and fingers reducing from 23.6 percent at baseline to 16.4 percent and 9.0 percent at week 12 and 24 respectively.

Measurements of disease activity also showed an effective response with a significant reduction in the mean juvenile arthritis disease activity score from 17.7 at baseline to 12.2 at week 12 and 7.2 at week 24. The percentage of patients achieving JIA American College of Rheumatology 30 / 50 / 70 / 100 response rates at week 24 were 85 percent / 73 percent / 50 percent / 27 percent respectively.

Using ultrasound at baseline, week 12, and week 24, 19.4 percent, 16.1 percent, and 11.5 percent of the wrist or finger joints showed an effusion (fluid in the joint), 18.8 percent, 12.7 percent, and 9.6 percent showed thickening of the joint lining and, with the Power Doppler function, 6.9 percent, 1.8 percent, and 5 percent of the joints showed excessive blood flow (hyperperfusion), which are all signs of inflammation. Overall, any sign of arthritis was detected by US/PD in 24.5 percent, 19.2 percent, and 17 percent of joints at baseline, week 12 and week 24 respectively.

FOI images are interpreted in three phases: an early phase (phase 1) where the flow of dye into the blood vessels can indicate a higher perfusion, an intermediate phase (phase 2) where the dye stays longer in a pathological than a normal vessel, and a late phase (phase 3) where dye remaining in the tissues demonstrates more vessel formation due to chronic inflammation.

Among this patient population, FOI showed a signal enhancement suggesting active inflammation in at least one phase in 38.7 percent, 29.2 percent, and 27.6 percent of the joints at baseline, week 12 and week 24 respectively.

Summarising the data across all 3 time points, the highest number of signals suggesting active inflammation were detected by FOI with 32 percent of joints (especially in phase 2), compared to 20.7 percent with US/PD and 17.5 percent by clinical examination. A high number of joints (21.1 percent) had FOI signals suggesting inflammation, but were clinically inactive. 20.1 percent of joints with FOI signals did not show any effusion, synovial thickening or hyperperfusion on US/PD.

"The ability of FOI to detect inflammation in joints not detected by clinical examination or US/PD will be helpful in guiding treatment decisions based on determining the number of affected joints. Also, being able to discriminate between painful but uninflamed joints and those with inflammation will avoid unnecessary treatment with conventional DMARDs or biologics in the former," Professor Horneff concluded.

JIA is a chronic debilitating disease of childhood and adolescence characterised by arthritis persisting for at least six weeks with onset before the age of 16 years. The polyarticular form involves more than four joints within the first 6 months. The incidence of polyarticular JIA varies worldwide with a vast difference in reported cases between different global regions as well as within individual countries. The incidence of JIA ranges from 0.83 per 100,000 children in Japan to 23 per 100,000 in Norway, with low rates in Asian populations and relatively higher frequencies in those of European descent, with an overall trend that this rate is increasing.3