New rapid ultrasound technique to assess synovitis of small joints of hands

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Erosive changes on x-ray are important findings which affect patient management, but x-rays are unable to assess the degree of synovitis and erosions in the first 6 months.

Ultrasound of small joints of the hand till recently concentrated mainly on using a sagittal approach to assess synovitis in the flexor and extensor recesses. A good article that summarizes the above was written by McNally E.G. [Skeletal Radiol 2008;37:99-113] In this article, he summarized articles from the literature that magnetic resonance imaging (MRI), compared to ultrasound, can detect thickening of synovium, capillary permeability, and is able to look at many joints in one plane and extracellular fluid.

The advantage of ultrasound is that it is readily available and costs less than MRI. Ultrasound can assess PIP 1 mm. A current grading system score that is used in McNally’s study is as follows: synovitis: Grade 1 – thickness up to 2 mm; Grade 2 – 2-4 mm thickness; and Grade 3 – more than 4 mm thickness. For Doppler flow: Grade 1 – no Doppler flow visible; Grade 2 – less than 50 percent Doppler flow; and Grade 3 – more than 50 percent Doppler flow within the region of maximum thickness of the synovium (where the thickness measurement is taken). [Skeletal Radiol 2008;37:99-113]

I have modified this as there can be confusion when there are hypoechoic changes in the collateral ligaments (especially proper collateral ligament) surrounding the bane area, but this is not synovitis. Thus, it is easier to use the following grading system:

Normal – hyperechoic collateral and synovial layer
Normal – no Doppler flow

Medical Centre, a thesis project was undertaken to look at the degree of synovitis compared to serum levels of biological markers such as anti-cyclic citrullinated peptide (CCP) levels. In conducting this study, several difficulties were encountered by the radiologist presenting this paper, and a paradigm shift and new technique was developed.

Using the sagittal approach, it was difficult to be sure when doing a second measurement after doing one set of measurements that the researcher was at the same plane to make the measurement, as bony landmarks in the sagittal plane were difficult to note, especially with erosive changes.

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In a recent study, ultrasound was compared to MRI of the MCP joints and ultrasound was more sensitive in detecting synovitis than MRI. However, MRI was better at assessing erosions, as MRI can detect erosions that are not visible on ultrasound. Therefore, ultrasound cannot monitor erosions and can only detect synovitis.

The limitation of this study was that only one expert musculoskeletal radiologist was involved and, therefore, there is a need for interobserver and intraobserver studies to be done. But after viewing the Figure illustrations, I suspect the correlation will be high as it is easy to measure the hypoechoic areas.

From our observations, we did x-rays at the same time as ultrasound on many patients, erosions were seen on ultrasound earlier than on x-ray. Thus, the previous importance given and labeling someone as having erosive RA versus non-erosive RA has been found not to be true as x-rays are not sensitive enough to detect the changes.

An important finding in our small study which might be an indicator of early RA even before biochemical markers appear is the fourth MCP joints and eight PIP joints rapidly with this technique. It takes only 8 to 10 minutes and does not miss the synovitis, which can also occur just on the ulna side, particularly in RA.

Future treatments will probably be based on combined synovitis and erosion indices and not just on the presence of erosions as the latter more accurately reflects the severity of disease. We are still analyzing our results to assess correlations of biochemical markers with ultrasound findings, but thus far, only a few of the markers have shown correlation with ultrasound findings.