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To the Editor:

It is possible to examine the inflammation of a joint, bursa, or tendon area with ultrasonography (US) using greyscale or Doppler imaging. The detection of perfusion in synovium is a relatively new phenomenon in rheumatology and the detection of a Doppler signal in the synovium is also thought to reflect the inflammatory state. Rheumatoid synovium is imaged by using color Doppler or power Doppler modes. The latter is thought to be better suited for depicting slow flows, although there is an article in the literature showing no big difference between these modes.

The aim of this report is to consider what a positive or negative power Doppler signal in the synovium means, especially in terms of histological data. And as well, to raise a question: have we thought too much of anatomy, i.e., the number of vessels (angiogenesis) in Doppler imaging, instead of explaining the existence or absence of Doppler signal with changes of flow (perfusion) in healthy and diseased synovium?

In the rheumatoid synovium the thickness of synovial lining hyperplasia, number of vessels, and stage of inflammation of the synovium correlate positively with each other, and the number of vessels is increased. The question is whether the angiogenesis of the synovitis is the cause or consequence (“chicken or egg?”). Another study with 44 synovial biopsies in patients with inflammatory joint diseases also showed that the number of vessels correlated positively with the inflammatory state of the synovium r = 0.629, p < 0.01; this statistic was not shown in the original report). However, the number of vessels did not correlate with the amount of Doppler signal. This was surprising, and so was the finding that the amount of Doppler signal and the histological score of synovitis did not correlate statistically in any significant way. However, when there was a Doppler signal in the synovium there was always a histological inflammation or a related condition in a joint of a patient with clinically suspected synovitis. This study was carried out by a sonographer and 17 video readers of the cases, none of whom determined a positive correlation with the histological inflammation of the synovium. Further, it was noted that the existence of Doppler signal in the synovium was not specific for inflammation. Other phenomena, such as forming fibrosis, could also give a positive Doppler signal in the synovium. Indeed, Walthier, et al have pointed out in their 2 reports that there was a positive correlation between the number of vessels and amount of Doppler signal. Unfortunately, they did not report the inflammatory stage of the synovium. They had 28 patients with osteoarthritis and only 19 patients with rheumatoid arthritis. A fourth report on the relationship between Doppler imaging and histology showed no positive correlation between the number of synovial vessels and amount of Doppler signal. The vascular endothelial growth factor could also be assumed to exaggerate perfusion. The acquisition of the image is important. The existence or nonexistence of Doppler signal in the synovium is inevitably a complicated issue. In light of present knowledge it is hard to say that the amount of Doppler signal correlates with the activity of histological synovitis. In other words, an estimation of the inflammatory stage using only the Doppler imaging mode (as nonexistent, mild, moderate, or severe) can be misleading. Detection of Doppler signal in the synovium of a patient is, however, a useful sign because it shows that the patient has some sort of an inflammation (when rare cases such as tumors have been excluded). A positive Doppler signal in the synovium may also enable a prediction of outcome and a diminishing Doppler signal correlates with other markers of healing. Doppler signal in the synovium is not specific for inflammation. It can also be found in other situations, such as forming fibrosis, as well as in a healthy synovium.

The goal of current treatment of rheumatoid arthritis is remission. The lack of Doppler signal in the synovium of a patient does not guarantee that there is no inflammation. In “sonographic remission,” greyscale findings should be normal. We need more research to understand the relationship between the histological inflammation and Doppler signal in the synovium. Perhaps we have concentrated too much on anatomy, i.e., the number of vessels (angiogenesis) in Doppler imaging. Moreover, the regulation of synovial perfusion in relation to Doppler signal deserves attention.

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