Diagnosing temporal arteritis – a non-invasive approach

Giant cell arteritis (GCA) is a treatable, but potentially sight- and life-threatening systemic vasculitis. Prompt and correct diagnosis is therefore important as early intervention can prevent complications such as irreversible blindness and cerebrovascular stroke. GCA is confirmed after histopathological assessment of a temporal artery biopsy (TAB), which is gold standard, but findings can be false negative in 15-30%. These false negative results may be due to the segmental nature of the disease, presenting with so-called skip lesions. It has therefore been suggested that biopsies should be of a certain length. However, biopsy specimen may shrink and the occasion that the length is measured has not been well defined. The aim with the first study was to investigate how the length of the biopsy changes during the procedure. The length of the biopsy was measured before excision, immediately after excision and after formalin fixation. The median length decreased by 12% after excision, but not further during fixation. In conclusion, temporal artery biopsies contract upon excision, but the contraction is small and is not likely to affect the histopathological examination.

TAB is also associated with risks such as nerve injury and postoperative hemorrhages. A non-invasive approach would therefore be of benefit. Previous attempts to find a non-invasive diagnostic tool, mainly using color doppler ultrasonography, have shown unsatisfying results and there is to date no non-invasive method for the diagnosis of GCA. Photoacoustic imaging (PAI) is an uprising technique that combines laser pulses and ultrasound and provides high-resolution 3D-images of the tissue architecture. PAI has the potential to become a non-invasive diagnostic tool for GCA, as shown in a pilot experiment (1). In the second study, we evaluate the safety of PAI regarding visual function and patient tolerability, and define the spectral signature in the healthy temporal artery. PAI of the temporal artery was performed in healthy subjects and visual function was tested. Photoacoustic images were generated from the artery. PAI did not affect the visual function and was well tolerated by the participants. The spectral signature of the artery wall could be clearly differentiated.

In the third study, we assess ultrasound center frequency shifts (CSF) as a non-invasive method to identify GCA. TAB specimen from subjects with suspected GCA were examined with ultrasound CFS ex vivo and thereafter histopathologically. The ultrasound CFS of the artery wall in GCA was significantly different from vessels without GCA.
In conclusion, both PAI and CFS are safe and promising non-invasive diagnostic tools for GCA. Further technical development is needed in order to enable in vivo examination, whereafter a large randomized clinical trial need to evaluate the clinical feasibility.

Publications


References