Demonstration of Pixel distribution in Muscle from MR imaging

When imaging muscle on MR we are looking for changes that occur which will demonstrate the change in the muscle from normal. This is often visually easy to recognise either due to increase in the amount of muscle fat, often seen in muscle atrophy (best on T1Weighted images), or with an increase in the amount of ‘free’ water in the tissue, often seen in inflammatory conditions (best seen on STIR imaging).

In myositis, an inflammatory muscle, we can see clinically both atrophy and inflammation. Making the diagnosis is not always easy and there are about 9 different clinical and biochemical parameters which are measured; none of which are seen to be much more than 70-75 % accurate in predicting the diagnosis – this includes muscle biopsy.

Straight reading of the MR images does not perform any better than the other 9 parameters. However by combining both the T1W and STIR images it is possible to produce a relative pixel distribution (T1W valves vs STIR values) which will allow classification of the images based on changes to the normal distribution.

The study would be in three parts. 1) A phantom study to calibrate the MR machines used against each other (T1W and STIR pixel values are in arbitery units and do not have finite values). 2) To display the images from normal volunteers to establish the normal ranges and 3) to demonstrate using patients with known myositis the difference in the disease and normal range.

The protocol used could be modified to see if exclusion of subcutaneous fat enhances the separation but this would add in segmentation of the image prior to the analysis. Sub group analysis of individual muscle groups and in patient with treated, relapse and overtreatment of myositis would be studies to understand the range of changes that occur.

The idea is to produce a clinically functioning tool which will alter the management of this particular group of patients.

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