

IN VIVO 3D REPRESENTATION OF THE LEVATOR ANI MUSCLE USING DIFFUSION TENSOR IMAGING WITH FIBER TRACTOGRAPHY: INITIAL RESULTS

Hypothesis / aims of study

The aims of this preliminary study are to demonstrate the feasibility of providing in vivo 3D architecture of the human levator ani muscle (LA) and to assess the value of tractography images to obtain averaged microstructural parameters, ie., the fractional anisotropy (FA) and the apparent diffusion coefficient (ADC).

Study design, materials and methods

Ten young female volunteers underwent diffusion tensor imaging (DTI) at 1.5T IRM (Achieva, Philips Medical System). Muscular tractography was performed for each of the three right and left subdivisions muscles of the LA and obturator internus muscle (chosen as the reference muscle of the pelvis). Number of numeric fibers, a scoring system of relevance of the 3D representation, FA and ADC have been calculated.

Results

The study was possible only for eight volunteers. The mean number of well-organized numeric fibers was of 15 for pubovisceral muscle, 13 for the puborectal muscle, 0 for the iliococcygeus muscle (all numeric fibers were considered as inaccurate) and 82 for the obturator internus muscle. The score of relevance of the 3D representation was considered as correct, acceptable and insufficient respectively for the pubovisceral, puborectal and iliococcygeus muscles and as good for the obturator internus muscle. The mean FA values ranged from 0.42 +/- 0.1; 0.43 +/- 0.2 and 0.41 +/- 0.15, and the mean ADC values from 1.36 +/- 0.5; 1.36 +/- 0.6 and 1.51 +/- 0.7 respectively for the pubovisceral, puborectal and iliococcygeus muscles. For the obturator internus muscle, the mean values were 0.36 +/- 0.15 and 1.48 +/- 0.5 respectively for the FA and the CDA.

Interpretation of results

The study of the pubovisceral and puborectal muscle of the LA is possible with a 3D representation (figure 1 and figure 2) using DTI with fiber tractography. Although, the study of the iliococcygeus muscle is more difficult probably due to the thinness of the muscle and technical limits. Good results for the obturator internus muscle demonstrate that DTI with fiber tractography is valuable in the study of pelvic muscle.

Concluding message

This study demonstrates the feasibility of visualizing at least two of the three subdivisions muscles of the complex LA architecture with a 3D representation using 1.5T-DTI with fiber tractography.

Figures

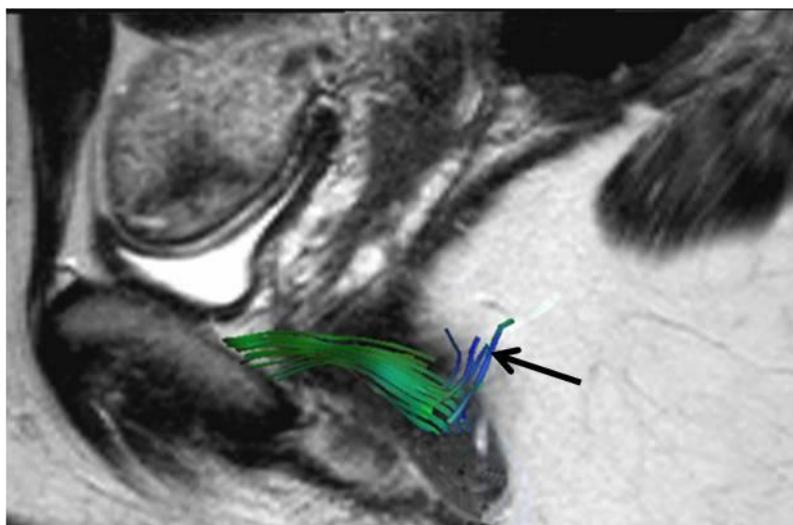


Figure 1: Fused left para sagittal T2 weighted and DTI tractography images shows a left pubovisceral muscle. Note the presence of some inaccurate fibers (arrow) compared to well-organized fibers.

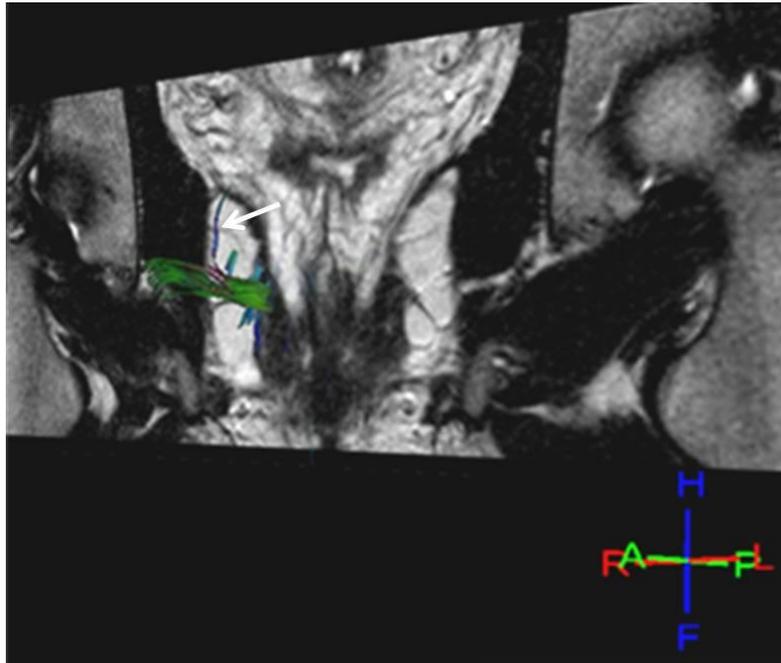


Figure 2: Fused left oblique coronal T2 weighted and DTI tractography images shows a right puborectal muscle. Note the presence of some inaccurate fibers (arrow) compared to well-organized fibers.

<i>Specify source of funding or grant</i>	None
<i>Is this a clinical trial?</i>	Yes
<i>Is this study registered in a public clinical trials registry?</i>	No
<i>Is this a Randomised Controlled Trial (RCT)?</i>	No
<i>What were the subjects in the study?</i>	HUMAN
<i>Was this study approved by an ethics committee?</i>	No
<i>This study did not require ethics committee approval because</i>	The Institutional Review Board waved the need of an ethics committee approval. All volunteers gave written informed consent.
<i>Was the Declaration of Helsinki followed?</i>	Yes
<i>Was informed consent obtained from the patients?</i>	Yes