ABSTRACT
Little is known about the deformation response of articular cartilage to shear loading. It is thought that excessive shear leads to destructuring of the collagen network, which can indicate the start of osteoarthritis. More insight in this effect could improve our insight in the early development of osteoarthritis. To examine this, porcine osteochondral samples from femoral condyle and trochlea of approximately 1x1 cm have been under a 12%-shear strain for 2 hours with a frequency of 1 Hz. After this the samples have been fixed, decalcified and sectioned into slices of 7 µm and 30 µm. The 7 µm slices have been stained with alcian blue or picrosirius red and examined with Brightfield microscopy. No differences were found between samples and unloaded controls. However, the 30 µm slides that have been examined with Differential Interference Contrast (DIC) microscopy, did show a response. Both in a condyle and a trochlea sample a diagonally pattern in the transition zone was shown. Above of that a condyle sample showed an outward radiating pattern in the superficial zone. Furthermore the swelling of the cartilage pre and post the shear test have been examined by measuring the thickness. On average the trochlea were thicker (average thickness = 2.34 mm) and needed a larger force (between approximately 3.1 N to 4.3 N) to obtain 12%-shear strain than the condyle (average thickness = 1.74 mm; force between 1.8 N to 3.1 N).