Proteomics of the meniscus and the importance of the meniscus in osteoarthritis

Background
Osteoarthritis (OA) is one of the most common joint diseases in the world, and there is currently no disease-modifying treatment available. Meniscectomy or arthroplasty are the most common treatments at orthopedic clinics. The knowledge about the early development of OA and the involved disease mechanisms is poor; hence there is a lack of diagnostics that could identify the disease in an early stage. A meniscus tear can either be due to an acute knee injury or slow degenerative changes of the meniscus during OA, which at the moment are unclear why and how they happen.

Aim
We aim to learn more about the degenerative changes and early disease processes of OA, with special focus on the meniscus. We have started up a biobank in which we collect knee tissues, synovial fluid and blood from OA and meniscectomy patients as well as healthy donors. These tissues will be studied using discovery mass spectrometry (MS), in order to learn more about the proteomic constitution. We also aim to compare proteomic data of menisci with various types of imaging data (e.g. MRI and μCT) and histological data.

Preliminary results
We have in one project compared articular cartilage and menisci from healthy donors, which showed that despite similarities between the two tissues, several proteins differ. The most common proteins in articular cartilage and meniscus were aggrecan and serum albumin respectively. In the same study we also compared two MS methods; data-dependent acquisition (DDA) and data-independent acquisition (DIA). DIA was shown to be the preferred method exhibiting less variation, more statistically significant proteins and no missing values. In another study we studied regional differences of OA menisci, and compared this with healthy donor menisci. The comparison is still under analysis, but we can clearly see differences in protein abundances between the regions of the diseased menisci.

Importance
These studies will give us more knowledge about which proteins that differ between healthy and diseased tissue, and which proteins that play important roles in the degeneration of menisci. This, in turn, could help us find biomarkers, that could help predict or diagnose OA in an earlier stage, and develop new disease-modifying treatments.