The Many Faces of Knee Joint Osteoarthritis

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Osteoarthritis is the most common type of arthritis. It is characterized by a breakdown of the cartilage surfaces that cover the ends of bones, resulting in pain, swelling, and stiffening of the joint. In the past, osteoarthritis was considered a wear and tear disease that occurred due to natural aging. However, today we accept that osteoarthritis is a joint disease that can be caused by a variety of factors and affects all tissue of a joint.

We studied the etiology of knee joint osteoarthritis in pre-clinical models for the past twenty years. In my presentation, I will focus on three risk factors for knee joint osteoarthritis:

(i) Trauma
(ii) Muscle weakness/imbalance and
(iii) Obesity

Knee trauma can be simulated in pre-clinical models by the transection of ligaments, the (partial) removal of the menisci, and by damage of the cartilage surface. Muscle weakness and imbalance can be achieved using muscle ablation, tenotomies, nerve transection, or a variety of chemical interventions that prevent muscle activation, for example botulinum toxin. Finally, obesity can be induced by genetic manipulation or by exposing animals to a high fat and/or a high fat and high sucrose diet.

In my presentation, I will specifically focus on models of anterior cruciate ligament transection (trauma), botulinum toxin injections into target muscles to produce muscle weakness and imbalance and exposing animals to high fat/sucrose diets that produce obesity, metabolic syndrome, and knee joint osteoarthritis. These studies provided the following general conclusions:

(i) Restoring normal joint function following trauma does not stop the progression of osteoarthritis
(ii) Knee extensor muscle weakness and imbalance is an independent risk factor for knee osteoarthritis, and
(iii) Diet-induced obesity causes metabolic syndrome, which in turn causes knee joint osteoarthritis.
(iv) Fibre diet interventions, aerobic exercise, and resistance training alleviate knee joint osteoarthritis by reducing metabolic syndrome, even in the absence of obesity reduction.

The following recent review paper addresses these issues in greater detail for the interested reader.

de Brito Fontana, H., & Herzog, W. (2021). The Role of Muscles in Knee Joint Osteoarthritis. *Sports Orthopaedics and Traumatology*