The treatment of osteoarthritis in healthcare today focuses on minimizing pain and retaining mobility. Osteoarthritis of the knee is a common disease and known to be associated with traumatic injuries, among other factors. An identified trend is that patients are younger and have expectations of life with the preservation of an active lifestyle. This results in numerous design challenges. The Continuum of Care approach is intended to manage pain and disease over an extended period of time. The Continuum of Care is being extended into younger patients who have suffered traumatic knee injuries. These patients are not good candidates for total joint replacement.

A common problem for young patients is localized cartilage damage. This can heal, but often results in a painful condition that requires intervention. A welded-woven three-dimensional polymer fabric was developed to mimic the properties of articular cartilage. A process for the laser welding reinforcement of the surface layers of three-dimensional fabrics was investigated. Confined compression creep and pin-on-disc wear studies were conducted to characterize the contribution of the surface welding reinforcement. All materials used in the studies have previously been used in orthopaedic devices or meet the requirements for USP Class VI approval.
The compressive behavior of three-dimensional fabrics was tailored by the inclusion of surface welds. The compressive properties of the welded-woven fabrics were shown to better approximate articular cartilage compressive properties than conventional woven materials. The wear performance was benchmarked against identical fabrics without welding reinforcement. The wear rates were significantly reduced and the lifespan of the fabrics was markedly improved due to surface welding.

Welding reinforcement offers a strengthening mechanism as well as a damage-resistant and damage-tolerant treatment for three-dimensional fabrics. Additionally, the concept of reinforcing three-dimensional fabrics in general has been proven and is transferrable to many industries and applications. The manufacturing approaches are scalable and robust.