University of Colorado
TECHNOLOGY TRANSFER OFFICE

Non-surgical prevention and treatment of knee osteoarthritis by correction of abnormal loading patterns

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Background

Osteoarthritis (OA), also called degenerative joint disease, is the breakdown of cartilage in the joint due to the wear and tear of daily living and activity. Overall, OA affects an estimated 20.7 million Americans, mostly after age 45, making it one of the most common orthopedic problems. Medical costs for OA are estimated from $15.5B to $28.6B annually. Without surgery OA often becomes untreatable, especially in advanced cases.

Because of its repetitive use in walking and running, the knee is often affected by age-related OA. Furthermore, knee trauma such as broken bones and torn cartilage or ligament can disrupt the integrity of the joint, leading to abnormal loading patterns (weight distribution within the joint) and premature OA. Prior to a surgical treatment, treatment of OA focuses on decreasing pain and improving joint movement, and may include exercises, weight control, medications, heat/cold therapy and joint protection. Braces are a popular way to treat OA; however, currently commercialized braces are intended to unload the involved or damaged side of the joint by either applying a valgus or varus force on the knee between 0-30 degrees. This force is only one dimensional and is does not help to correct the abnormal knee loading.

Technology

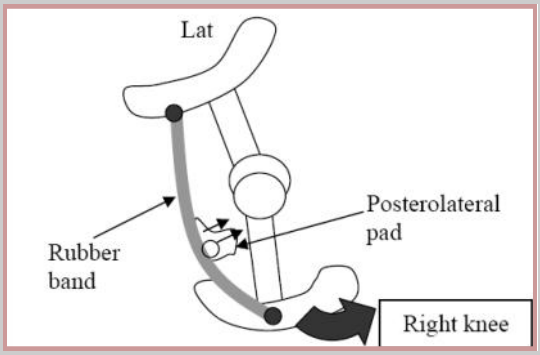
Dr. Kazuyoshi Gamada of the University of Colorado has developed a new, non-surgical method for restoring or improving knee abnormal loading patterns, effective for treating the early stages of OA. Dr. Gamada discovered that the abnormal loading pattern in standing can be corrected by altering the rotational alignment in the flexed position using a torsional force. This force is applied to correct tibial translational and rotational malalignment. Based on the above theory, this technology also provides a brace that is designed to alter the rotational alignment in the flexed position during the swing phase, which will ultimately correct the loading pattern during the standing phase. Once the abnormal loading pattern is corrected, nearly normal knee motion and physical function can be restored, minimizing pain. This technology has the potential to be a novel treatment strategy for the early phase of knee OA and a novel prevention strategy for the asymptomatic healthy population.

Development Status

CU is now developing a prototype device which will soon be available for testing.

Potential Applications

In addition to its use in treating early OA, this technology also works as a prevention strategy for the healthy population. A market already exists for OA products such as knee braces, training equipment, and rehabilitation equipment; the device's core assembly - the "rotation corrector" - could form the basis for a variety of joint protection and OA treatment devices.



A sample brace comprising a hinged joint