

Accurate and Quantitative Mechanical Pivot Shift Device for Evaluating Knee Stability

Tech ID: 21865 / UC Case 2011-097-0

BACKGROUND

Injury to the anterior cruciate ligament (ACL) is a common occurrence in many sports, with 135,000 ACL injuries in the United States that lead to over 95,000 reconstructions per year. To evaluate ACL integrity, orthopaedic practitioners perform a manual pivot shift exam by physically testing rotational knee stability. The manual pivot shift is the current gold standard and is routinely used to diagnose patients and determine rotational stability of the knee following ACL reconstruction. Many studies have shown that rotational stability directly correlates with patients' ability to return to sports and their subjective outcomes after ACL reconstructions. However, the results of the manual pivot shift are not reproducible and difficult to interpret, as the execution of the manual pivot shift varies from clinician to clinician due to difficulties in performing the test. What orthopaedic practitioners need is a standardized test that precisely measures ACL integrity over time in a single patient and also between patients to give meaningful results that can be used to make accurate clinical assessments regarding knee stability.

TECHNOLOGY DESCRIPTION

Investigators from the Orthopaedic Surgery department at UCSF have designed a novel device that mimics and automates the pivot shift exam. The device applies consistent forces and moments to the knee joint, both between different knees and also between different knee states, allowing for objective and reproducible quantification of knee stability. Furthermore, high resolution motion capturing systems, like the NDI Optotrak, are used together with the device to provide clinically-relevant kinematic outputs related to knee stability.

Current and future work is focused on validating the device on graded knee deficiencies and developing device designs for use in a clinical setting.

ADVANTAGES AND SUGGESTED USES

- ▶ **Simple and Innovative Design:** Device can be easily manufactured and readily implemented for biomechanics testing and clinical use.

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OTHER INFORMATION

KEYWORDS

pivot shift, ACL injury, knee stability, orthopaedic surgery, sports therapy, sports medicine

CATEGORIZED AS

- ▶ **Medical**
- ▶ **Devices**
- ▶ **Research Tools**
- ▶ **Other**

RELATED CASES

2011-097-0

▶ **Consistency:** Mechanical device results in a standardized pivot shift test.

▶ **Accurate and Quantitative Results:** Reliable results for 1) diagnosis, 2) assessing clinical outcomes, and 3) optimizing surgical treatments.

▶ **Sensitive:** Reproducible results allow for measurement of subtle differences in injury sub-phenotypes and healing progression.

RELATED MATERIALS

▶ Sena, M.; Chen, J.; Dellamaggioria, R; Coughlin, D.G.; Lotz, J.C.; and Feeley, B.T. 2013. "Dynamic evaluation of pivot-shift kinematics in physeal-sparing pediatric anterior cruciate ligament reconstruction techniques". Am J Sports Med. PMID: 23408589.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,521,965	12/20/2016	2011-097

OTHER INFORMATION

The investigators welcome the opportunity to collaborate with industry partners.

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