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Personalized Quadriceps Tendon Harvesting System for ACL Reconstruction

Stanford researchers have developed a first-to-market personalized surgical system that optimizes quadriceps tendon (QT) harvesting for ACL reconstruction. While the QT is an increasingly popular autograft choice, current commercial tools rely on fixed-width parallel cutting and lack intraoperative thickness measurement capabilities. Due to the variability of thickness of the QT along its length, this critical gap often leads to oversized grafts (causing unnecessary tissue waste and quadriceps weakness) or undersized grafts (increasing the risk of failure and revision).

This comprehensive system solves this problem through **three integrated components**:

1. **Minimally Invasive Measuring Jig**: A calibrated, instrument featuring an upper and lower tine that precisely measures in vivo tendon thickness through a small incision.
2. **Quadriceps Graft Size Calculator**: A proprietary, mathematically proven algorithm that predicts the final graft diameter based on preoperative MRI and/or intraoperative measurements. Validated retrospectively in a clinical study, the continuous prediction method has a high accuracy within ±1.0 mm of the actual graft size.
3. **Differential-Width Tendon Cutting Tool**: An adjustable instrument with that allows surgeons to dial in a customized width and cuts the tendon strip along a controlled path, eliminating the lateral drift and inaccuracies of freehand cuts.

Together, these components provide predictive decision support, allowing surgeons to plan, measure, and execute a truly personalized graft harvest.

Stage of Development
Proof of concept

Applications

- Sports medicine and Orthopedic surgery (primary ACL reconstruction, multi-ligament knee reconstructions).
- Surgical training and education
- Preoperative planning software integration
- Educational and research training tool.

Advantages

- First-to-Market Solution: Uniquely covers measurement, planning, and execution for differential-width tendon harvesting.
- Personalized, Optimized Graft Sizing: Decreases graft failure rates from undersizing and avoids extra tendon removal from oversizing.
- Reduced Donor-Site Morbidity: Harvests only the necessary tissue, sparing healthy tendon to promote faster recovery of quadriceps strength.
- Enhanced Precision and Safety: The cutting tool prevents lateral drift and avoids inadvertent injury to neighboring muscle fibers.

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