

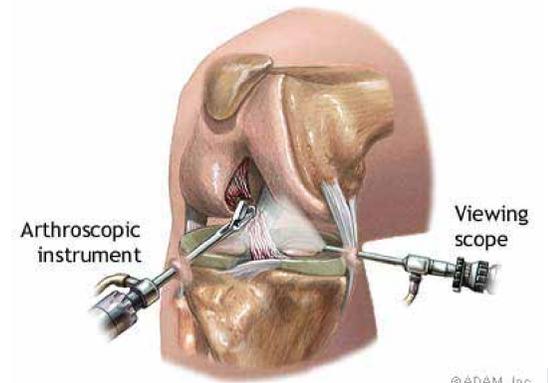
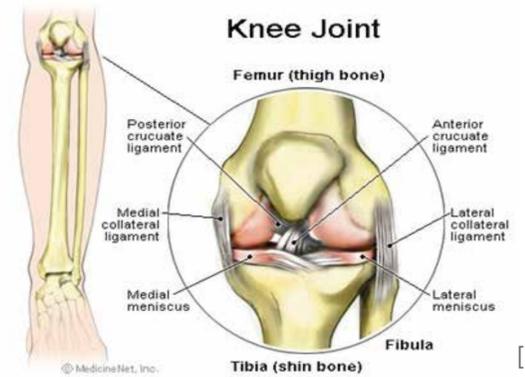
INNOVATIVE ARTHROSCOPIC INSTRUMENT FOR THE KNEE

CONTEXT & PROJECT

Over 600,000 arthroscopic knee procedures are performed every year in the U.S. [1] Tissue can be damaged through trauma (such as a sports injury) or through degradation over time. Preserving as much healthy tissue as possible is essential for a long-lasting and stable recovery [1].

Arthroscopic procedures are performed using a viewing scope, irrigation pump, and instruments. Modern scopes and pumps are integrated, requiring the creation of only two portals. This puts serious constraints on the surgeon's vision of and access into the knee.

Our goal was to apply a user-centered design philosophy to identify **opportunities for innovation** in this space. By understanding the preferences and problems of surgeons, we were able to develop a compelling new arthroscopic instrument that **adds functionality** over existing instruments while also **reducing cost**. Its simple design is **familiar to surgeons**, making a strong business case for **widespread adoption**.



[1] S. R. Montgomery, A. Zhang, S. S. Ngo, J. C. Wang and S. L. Hames, "Cross-sectional Analysis of Trends in Meniscectomy and Meniscus Repair," Orthopedics, vol. 36, no. 8, pp. e1007-e1013, 2013.
[2] Health, Medicine and Anatomy Reference Pictures, "Knee Joint Ligaments," 5 September 2013. [Online]. Available: <http://healthfavo.com/knee-joint-ligaments.html>. [Accessed 22 November 2013].
[3] Joint Implant Surgeons, Inc. (2014). Treatment: Knee Arthroscopy [Online] Available: <http://www.jointimplantsurgeons.com/upload/content/image/Knee%20Arthroscopy.jpg> [Accessed 18 April 2014].

PROCESS

-  **RESEARCH**
THE MARKET
-  **EMPATHIZE**
WITH SURGEONS
-  **IDENTIFY**
PROBLEMS
-  **IDEATE**
SOLUTIONS
-  **DEVELOP**
MECHANISMS
-  **EVALUATE**
PROTOTYPES
-  **DELIVER**
AND DOCUMENT

INSIGHTS

In designing a new instrument, we needed to develop a deep understanding of surgeon habits, needs, and frustrations. Some of these insights include:

Surgeons have **different preferences** for how they hold and use instruments.

Tactile feedback gives surgeons confidence about what an instrument is doing to tissue.

Surgeons must correlate movement on a **large 2D display** with movement in a **small 3D joint**.

Sometimes surgeons will use sub-optimal instruments to **avoid switching tools**.

The size of the knee is a problem that demands **precise, comfortable, and compact** design.

There are dozens of instruments on the market, but surgeons often **use the same 2 or 3** across all their procedures.

"This procedure is like a pool full of alligators: it's a question of which challenge will bite you first" - Surgeon Interview

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