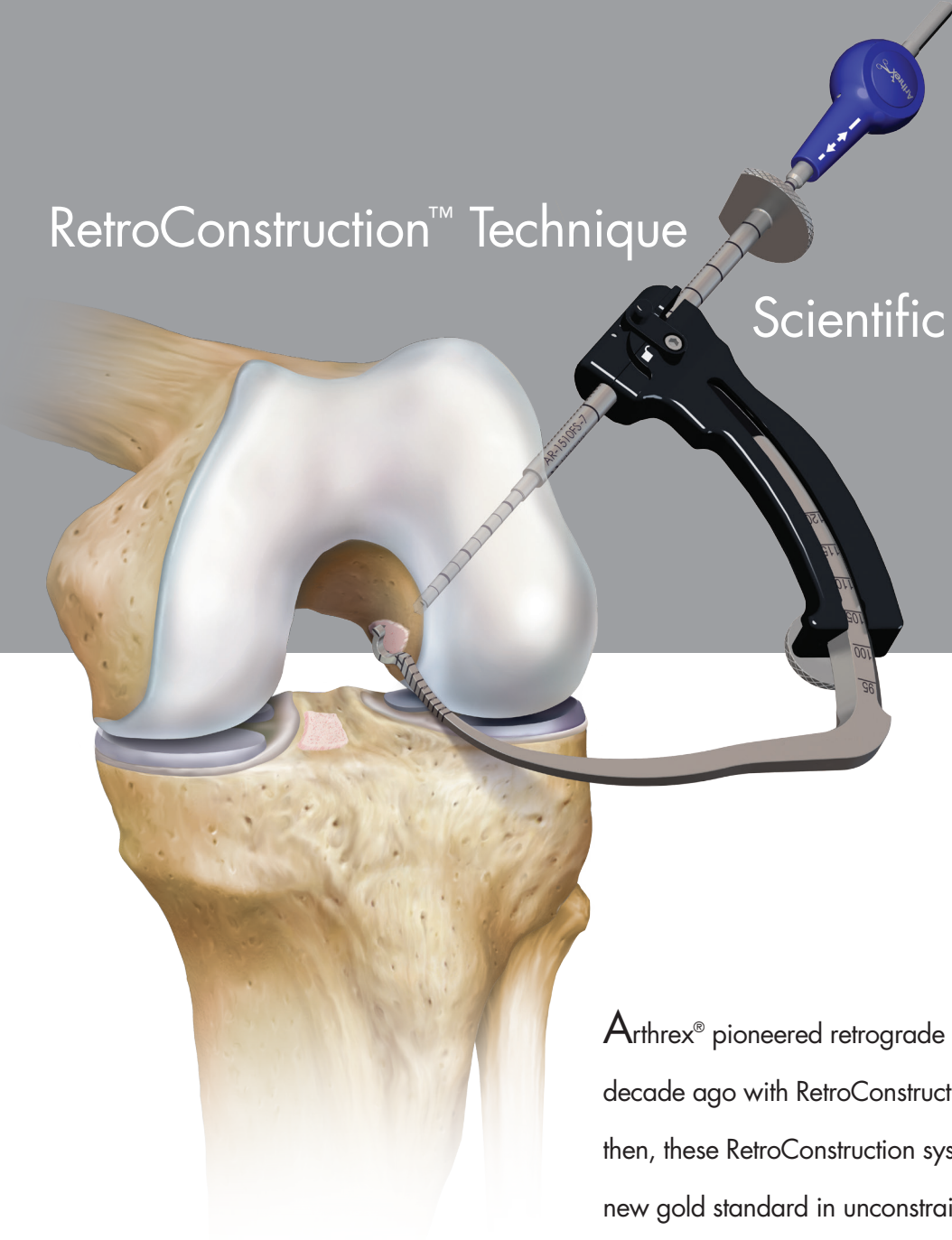


# RetroConstruction™ Technique

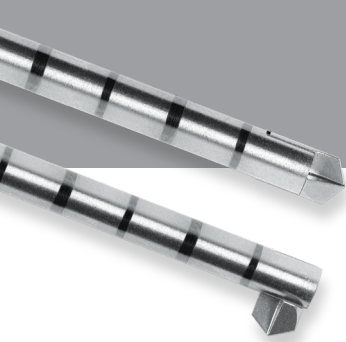
## Scientific Update



Arthrex® pioneered retrograde reaming over a decade ago with RetroConstruction™ Systems. Since then, these RetroConstruction systems have become a new gold standard in unconstrained, anatomic drilling for ACL reconstruction. Multiple published studies have demonstrated superior socket placement, better quality tunnels and less morbidity than standard cannulated reamers.\*



\*data on file



# RetroConstruction™ Technique Scientific Update

Abebe ES  
Moorman CT III  
Dziedzic TS  
Spritzer CE  
Cothan RL  
Taylor DC  
Garrett WE Jr  
DeFrate LE

Abebe ES  
Utturkar GM  
Taylor DC  
Spritzer CE  
Kim JP  
Moorman CT III  
Garrett WE J  
DeFrate LE

Okafor EC  
Utturkar GM  
Widmyer MR  
Abebe ES  
Collins AT  
Taylor DC  
Spritzer CE  
Moorman CT III  
Garrett WE J  
DeFrate LE

McAdams TR  
Biswal S  
Stevens KJ  
Beaulieu CF  
Mandelbaum BR

Lopes R  
Klouche S  
Odri G  
Grimaud O  
Lanternier H  
Hardy P

## Improved Socket Placement and Clinical Results

*Femoral Tunnel Placement During Anterior Cruciate Ligament Reconstruction: An In Vivo Imaging Analysis Comparing Transtibial and 2-incision Tibial Tunnel-independent Techniques.* *Am J Sports Med.* 2009; 37(10):1904-1911. doi: 10.1177/0363546509340768.

- Femoral sockets created with Arthrex® RetroConstruction drilling technique were compared with sockets created using a transtibial drilling technique on 16 patients. Socket position from each group was compared with the position of the native ACL on the contralateral knee using multi-planar MRI and 3D modeling.
- The RetroConstruction drilling technique placed the graft significantly closer to the center of the native ACL attachment compared to the transtibial technique, 3 mm versus 9 mm respectively.

*The Effects of Femoral Graft Placement on In Vivo Knee Kinematics after Anterior Cruciate Ligament Reconstruction.* *J Biomech.* 2011;44(5):924-929. doi: 10.1016/j.jbiomech.2010.11.028.

- The knees from the same patients as the first Abebe et al study (above) were tested 6-36 months out from surgery. All patients underwent MRI and biplanar fluoroscopy to measure *in vivo* kinematics during a lunge motion. Operative knees were compared with normal contralateral knees.
- Knees drilled with the transtibial technique had significantly more anterior translation, medial tibial translation and rotation than the normal knees and knees drilled with the RetroConstruction technique. Knees drilled with the RetroConstruction technique more closely reproduced normal knee function.

*The Effects of Femoral Graft Placement on Cartilage Thickness after Anterior Cruciate Ligament Reconstruction.* *J Biomech.* 2014;47(1):96-101. doi: 10.1016/j.jbiomech.2013.10.003.

- The knees from the same patients as the first Abebe et al studies (above) were imaged with high resolution MRI and the cartilage thickness was mapped through 3D modeling at a mean 18-20 months after ACLR.
- Patients' knees reconstructed with transtibial technique showed significantly decreased cartilage thickness compared to the normal contralateral knee and knees reconstructed with RetroConstruction technique. There was no significant difference between knees reconstructed with RetroConstruction technique and the normal contralateral knees.

## Superior Tunnel Quality and Decreased Patient Morbidity

*Tibial Aperture Bone Disruption after Retrograde Versus Antegrade Tibial Tunnel Drilling: A Cadaveric Study.* *Knee Surg Sports Traumatol Arthrosc.* 2008;16(9):818-822. doi: 10.1007/s00167-008-0554-6.

- ACL tunnels were drilled in eight matched-pair cadaver tibias using either RetroConstruction technique or a cannulated reamer (antegrade). Micro-CTs were taken of the drilled tibias and analyzed by three musculoskeletal radiologists.
- Tibial aperture irregularity and fracture lines were seen in all antegrade-drilled tunnels. No irregularity or fracture lines were seen in tunnels created with the RetroConstruction technique.

*Does Retrograde Tibial Tunnel Drilling Decrease Subchondral Bone Lesions During ACL Reconstruction? A Prospective Trial Comparing Retrograde to Antegrade Technique.*

[Published online ahead of print January 8, 2016]. *Knee.* 2016;23(1):111-5. doi: 10.1016/j.knee.2015.09.010.

- A multi-center, prospective study of 43 patients, 15 with antegrade-drilled tibial tunnels and 28 with retrograde-drilled tibial tunnels. MRIs and pain were assessed during the first postoperative week.
- Tibial edema was significantly more frequent in the antegrade group. Tibial edema showed a correlation to early postoperative pain.

Lubowitz J  
Schwartzberg R  
Smith P

*Randomized Controlled Trial Comparing All-inside Anterior Cruciate Ligament Reconstruction Technique with Anterior Cruciate Ligament Reconstruction with a Full Tibial Tunnel.* *Arthroscopy*. 2013;29(7):1195-1200. doi: 10.1016/j.arthro.2013.04.009.

- All-inside ACL Reconstruction resulted in less postoperative pain and similar clinical outcomes than a full tunnel technique.

Benea H  
d'Astorg H  
Klouche S  
Bauer T  
Tomoaia G  
Hardy P

*Pain Evaluation after All-Inside Anterior Cruciate Ligament Reconstruction and Short Term Functional Results of a Prospective Randomized Study.* *Knee*. 2014;21(1):102-106. doi: 10.1016/j.knee.2013.09.006.

- The results show that postoperative pain, knee stability, ranges-of-motion and graft positioning were better for the all-inside technique than the traditional full-tunnel technique.
- The all-inside technique can be considered a valid, reliable procedure with very good results for pain, stability and knee function. The all-inside technique seems to be a promising future option as a minimally invasive technique.

### **Better Cortical Fixation**

Okazaki K  
Matsubara H  
Osaki K  
Tashiro Y  
Mizu-Uchi H  
Hamai S  
Doi T  
Iwamoto Y

*Femoral Tunnel Apertures on The Lateral Cortex in Anterior Cruciate Ligament Reconstruction: An Analysis of Cortical Button Fixation.* *Arthroscopy*. 2014;30(7):841-848. doi: 10.1016/j.arthro.2014.03.004.

- The external cortical hole size of sockets drilled with the Arthrex® FlipCutter® (3.5 mm diameter) and the S&N drilling system (4.5 mm diameter) were compared at common drilling angles in a 3D model of real patient femurs.
- Oblique entry created larger holes in the femoral cortex for both systems. However, the larger diameter of the S&N system created significantly larger holes than the Arthrex system.
- Since a hole size of 6.5 mm is the critical limit to cortical fixation of common ACL button implants (12-13 mm) the S&N system significantly limited the ability to create a femoral socket. The FlipCutter however created an acceptable hole size in all but the most extreme angles.

Smith P  
DeBerardino T

*Tibial Fixation Properties of a Continuous-Loop ACL Hamstring Graft Construct with Suspensory Fixation in Porcine Bone.* [published online ahead of print October 27, 2014]. *J Knee Surg*. doi: 10.1055/s-0034-1394167.

- All-inside GraftLink® continuous loop soft tissue graft with TightRope® suspensory fixation provided adequate strength for tibial fixation in ACL reconstruction and was superior to interference screw fixation.

### **ACL Socket Drilling in Skeletally Immature Patients**

Nawabi D  
McCarthy M  
Graziano J  
DeMille P  
Chiaia T  
Green D  
Cordasco F

*Return to Play and Clinical Outcomes after All-inside, Anterior Cruciate Ligament Reconstruction in Skeletally Immature Athletes.* *Orthop J Sports Med.*, 2014;2(7)(suppl 2):1. doi: 10.1177/2325967114S00038.

- An all-inside, physéal-sparing ACL reconstruction technique using hamstring autograft demonstrates excellent subjective and objective clinical outcomes in skeletally immature athletes without growth disturbance.

Nawabi DH  
Jones KJ  
Lurie B  
Potter HG  
Green DW  
Cordasco FA

*All-Inside, Physéal-Sparing Anterior Cruciate Ligament Reconstruction Does Not Significantly Compromise The Physis In Skeletally Immature Athletes: A Postoperative Physéal Magnetic Resonance Imaging Analysis.* *Am J Sports Med.* 2014;42(12):2933-2940. doi: 10.1177/0363546514552994.

- Twenty-three skeletally immature patients were followed after having physéal sparing ACLR with FlipCutter. Growth plate sensitive MRI and x-rays were taken at 6 and 12 months revealing no growth arrest, articular cartilage damage or AVN.

Xerogeanes JW  
Hammond KE  
Todd DC

*Anatomic Landmarks Utilized for Physéal-Sparing, Anatomic Anterior Cruciate Ligament Reconstruction: An MRI-Based Study.* *J Bone Joint Surg Am.* 2012;94(3):268-76. doi: 10.2106/JBJSJ.01813.

- Defined drilling landmarks for anatomic, all epiphyseal femoral ACL drilling. Only FlipCutter, with small pin diameter of 3.5 mm, spared lateral sided structures (popliteus, LCL) while still allowing a socket of at least 7 mm to be drilled.

