The Acorn Beath Couple: Articular Salvation for Double-Bundle Femoral Tunnels in Cruciate Ligament Reconstruction

Yuri M. Lewicky, MD

Abstract

With the recent increase in interest in arthroscopic double-bundle cruciate reconstructions, efficient, safe, and reproducible techniques are needed. This technical trick is applicable to both arthroscopic anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) reconstruction when double-bundle femoral tunnels are performed through an accessory far lateral or far medial incision as with the all-inside femoral tunnel drilling approach.

A standard double-bundle cruciate reconstruction technique is applied until placement of the femoral footprint Beath pins in anticipation of tunnel drilling. Femoral footprint targeting with a Beath pin requires use of a far accessory portal. Before the long Beath pin is introduced into the joint, an acorn reamer is placed over the Beath pin to within 5 mm of the tip, thus creating an acorn Beath couple. The eyelet pin end is loaded onto a quick-release pin collet driver, leaving the acorn reamer free to turn. The acorn Beath couple is then introduced into the appropriate accessory portal and positioned in the center of the desired femoral footprint. An assistant holds the reamer shaft while the Beath pin is advanced. The collet driver is then disengaged from the pin and replaced with an adjustable chuck and secured to the acorn reamer shaft of the acorn Beath couple. The femoral tunnel is drilled to the appropriate depth, and the Beath pin is pulled out the anterior thigh. Doing so disengages the acorn reamer and allows for safe removal of the reamer from the notch. The technique is then repeated with the coupling of a 4.5 Endobutton reamer and the Beath pin.

Recent literature supports the finding that long-term outcomes after anterior cruciate ligament (ACL) reconstruction are less successful than previously thought. Some patients develop significant arthritic changes after 10 years. Because of less than perfect results, the single-bundle ACL reconstruction has been called into question. Whether the arthritic changes are caused by the initial injury itself or by partial restoration of normal knee kinematics as occurs with single-bundle reconstruction is a matter of debate.

Therefore, researchers have begun to focus on cartilage preservation and anatomical reconstruction of the native 2 bundles in the ACL. Although no long-term clinical data support better results with double-bundle ACL reconstruction, biomechanical data have shown that double-bundle reconstruction more closely recreates normal knee kinematics with respect to translation and rotation. In addition, it is well known that iatrogenic cartilage lesions are a frequent complication of knee arthroscopy and that simple grade II lesions (International Cartilage Research Society) never go away.

The technique described here is useful for both ACL and posterior cruciate ligament (PCL) double-bundle reconstruction with proximal Endobutton CL (Smith & Nephew Inc, Andover, MA) fixation. The focus of this technique is on allowing for proper footprint targeting while protecting the articular surfaces of the femoral condyles. Lack of intraoperative articular surface protection may further lead to poorer long-term results after ACL and PCL reconstruction. In addition, less experienced surgeons may sacrifice the desired footprint of the bundle for fear of causing iatrogenic harm to the cartilage surface. The acorn Beath couple minimizes this possibility.

Dr. Yuri Lewicky is an Orthopaedic Surgeon specializing in arthroscopy and reconstruction of the shoulder and knee at Summit Center Sports Medicine and Northern Arizona Orthopaedics, Flagstaff, Arizona.

Requests for reprints: Yuri M. Lewicky MD, Summit Center Northern Arizona Orthopaedics, 1485 N Turquoise Dr, Suite 200, Flagstaff, AZ 86001 (tel, 800-773-2553; fax, 928-226-3083; e-mail, lewickyy@summitctr.net).

Am J Orthop. 2007;36(12):XX-XX. Copyright Quadrant HealthCom Inc. 2007. All rights reserved.
This technique is applicable to both arthroscopic ACL and PCL reconstruction when double-bundle femoral tunnels are performed through a single medial incision, as with the all-inside femoral tunnel drilling approach. A standard double-bundle cruciate reconstruction technique is applied until placement of the femoral footprint Beath pins in anticipation of tunnel drilling. Footprint targeting with a Beath pin in cruciate double-bundle reconstruction requires use of the far accessory medial portal for posterolateral bundle creation in ACL reconstruction and of the accessory lateral portal for posteromedial and anterolateral bundle creation in PCL reconstruction.

Before the Beath pin is introduced into the joint, a graft-sized acorn reamer is placed over a long Beath pin to within 5 mm of the pin tip, thus creating an acorn Beath couple (Figure 1). Note that the Beath pin allows for reamer insertion from the eyelet end only. Last, the eyelet pin end is loaded onto a quick-release pin collet driver, leaving the acorn reamer free to turn between the Beath pin tip and the driver. The acorn Beath couple is introduced into the far medial or lateral accessory portal, depending on the procedure being performed (Figure 2). The Beath pin tip is then positioned in the center of the properly selected femoral footprint. For posterolateral bundle placement in ACL reconstruction, this corresponds to the 3:15 position and just anterior to the anteromedial bundle tunnel (left knee). For PCL reconstruction, the anterolateral and posteromedial bundles have the center of their footprints 7 mm and 14 mm inferior to the intercondylar roof and 7 mm and 4 mm posterior to the anterior articular margin, respectively. Before pin advancement, care is taken to ensure that the acorn reamer is not against the footprint or the articular cartilage of the contralateral femoral condyle. An assistant holds the interposed acorn reamer shaft with a wet Ray-Tec sponge or sterile towel to prevent

Figure 1. The acorn Beath couple, composed of an acorn reamer placed over a long Beath pin to within 5 mm of the pin tip and attached to a quick-release driver.

Figure 2. Artistic rendition of the acorn Beath couple placed into the joint as a unit through the accessory portal (posterolateral bundle in anterior cruciate ligament reconstruction, as depicted).

Figure 3. Artistic rendition of advancement of the Beath pin into the center of the femoral footprint with the acorn reamer free and its tip pulled back 5 mm.

Figure 4. The collet driver is replaced with an adjustable chuck, secured to the acorn reamer, and the femoral tunnel is drilled to the appropriate depth.
Cartilage damage prevention has become clearer, as our ability to restore damaged cartilage to normal has proved more difficult. The importance of iatrogenic cartilage damage prevention has become clearer, as our ability to restore damaged cartilage to normal has proved more difficult. For an all-inside femoral tunnel double-bundle technique, the Endobutton provides excellent fixation. Studies have shown that the Endobutton has equivalent outcome scores when tested against other femoral fixation devices as well as near superior fixation biomechanics with respect to ultimate load to failure and construct slippage. It is the size and maneuverability obviate the need for angled screwdrivers and avoids traumatic insertion of screw threads past the articular surfaces of the femoral condyles.

**CONCLUSIONS**

The acorn Beath couple is a safe and effective way to protect articular surfaces from iatrogenic harm while allowing for footprint targeting. This technique has been perfected in the laboratory with cadaver double-bundle cruciate reconstructions and has been applied in the clinical setting as well, without complication. I have been quite pleased with the resulting lack of articular surface damage.

**AUTHOR’S DISCLOSURE STATEMENT AND ACKNOWLEDGMENTS**

The author reports no actual or potential conflict of interest in relation to this article.

A special thank you to Shane Bass for his artistic renditions and technical assistance. Thanks also to the San Diego Sports Medicine and Arthroscopy fellowship mentors who instilled in me a new appreciation for the fragility of articular cartilage and for the lasting trail that an inexperienced arthroscopist can leave. The signature of the best surgeons is written with invisible ink.
REFERENCES


