ACL RECONSTRUCTION USING ENDOBUTTON CL BTB FIXATION SYSTEM:
FOR BOTH ANTERO-MEDIAL and TRANSTIBIAL REAMING OF THE FEMORAL TUNNEL.

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INTRODUCTION:
The ENDOBUTTON™ Continuous Loop (CL) Bone-Tendon-Bone (BTB) Fixation System (Smith and Nephew, Inc., Andover MA) is a strong, simple, straight-forward, reproducible, and dependable technique for fixation of Anterior Cruciate Ligament (ACL) grafts that have a bone block for the femoral tunnel such as BTB autografts, BTB allografts, Achilles tendon allografts, and Quadricep tendon grafts. The ENDOBUTTON CL BTB System offers surgeons many advantages over current fixation methods of the femoral bone plug.

ADVANTAGES:
This technique is simple, straight-forward, reproducible, and dependable. There is no “math” involved such as calculations, additions, or subtractions of graft or tunnel lengths as any measurement is read directly and can be confirmed easily. This minimizes errors and translates into a low learning curve for the surgeon.

Bone blocks are fully 360 degree appositional in the femoral tunnel unlike interference fixation.

This technique eliminates the problem of graft–tunnel mismatch such as long grafts. By allowing the femoral bone plug to be countersunk the appropriate depth, the tibial bone plug will reproducibly lay flush with the tibial cortex. This is thought to be the strongest point of fixation between the tibial bone plug and the anterior tibial cortex. Thus tibial interference screws can be placed under direct visualization minimizing the risk of screw divergence and injury to the graft.

The ENDOBUTTON CL BTB delivers strong fixation without the drawbacks of interference fixation such as screw divergence, “posterior blow-out”, laceration of the graft, graft-tunnel mismatch (long grafts), and screw breakage. Perforation of the posterior wall does not compromise graft fixation.

The ability to “hide” the CL within the femoral bone block allows it to be guided up the femoral tunnel easily without any additional bulk or guiding sutures.

This technique greatly simplifies revision ACL surgery for many reasons. If the primary reconstruction was done using this technique, there is no concern for dealing with a void left from interference fixation. The surgeon can proceed just as if performing a primary ACL reconstruction. If the primary procedure used a femoral interference screw, reaming around the previous screw or removing it will not compromise fixation.
Poor quality of bone as can be seen from previously reconstructed knees does not compromise fixation.
**TECHNIQUE OVERVIEW:**
To emphasize the simplicity of this technique, an overview is presented first followed by a more detailed description with accompanying pearls. The principle of the technique is the same for either the “anatomic” (anteromedial) technique or transtibial technique.

*The main difference between the two techniques is in using a modified depth gauge with suture for the anteromedial technique vs using a straight depth gauge for the transtibial technique.* Both techniques will subsequently be explained in detail.

1. **Standard knee arthroscopy is performed.**
2. **Harvest the graft when using autologous tissue.**
3. **Ream the tibial and femoral tunnels in the usual manner** (in the order per surgeon preference).
4. **Use the appropriate depth gauge and measure from the lateral femoral cortex to the opening of the tibial tunnel.**
   - **Anteromedial technique:** Use a modified “suture” depth gauge and mark/cut the suture at the opening of the tibial tunnel.
   - **Transitibial technique:** Use the supplied straight depth gauge with associated “stop”. Set the stop at the opening of the tibial tunnel.
5. **Prepare the graft in the usual manner.** Lay the straight depth gauge or marked/cut suture directly adjacent to the graft with one end corresponding to the end of the tibial bone plug. Measure directly the length of the needed CL from the other end of the depth gauge / suture to the point of attachment on the graft.
6. **Attach the ENDOBUTTON CL to the graft.**
7. **Pass the graft and secure the femoral bone plug.** Flip the ENDOBUTTON outside of the lateral femoral cortex and tension the graft.
8. **Secure the tibial bone plug.**

**TECHNIQUE IN DETAIL:**
This technique has greatly simplified all measurements. The few needed measurements are direct. As there are no calculations such as subtracting or adding lengths of grafts, tunnels, or depth gauges; this technique has a relatively small learning curve which also translates into dependable and reproducible results minimizing error.

It is beyond the scope of this chapter to discuss in detail the pros, cons, and pearls of whether the surgeon reams the femoral tunnel via the anteromedial portal or through the tibial tunnel. Rather, the scope of this publication is to focus on the technique of securing the femoral bone plug using either method. The ENDOBUTTON CL BTB works very well with either method of reaming the femoral tunnel with only some minor differences – mainly the depth gauge that is used. The ENDOBUTTON CL BTB works well with any graft that uses a bone block for femoral fixation including autologous BTB grafts as well as grafts such as an Achilles tendon or Quadricep tendon graft.

1. **Standard knee arthroscopy is performed:**
   - Standard set up and arthroscopic techniques are used. I prefer to use the same portal placement with either technique.
2. **Harvest the graft when using autologous tissue:**
Grafts are harvested and prepared in the usual manner (attaching the CL will be explained in detail under “6. Attach the ENDobutton CL to the graft”). Bone blocks are kept to 15 mm to 20 mm in length.

**“Anatomic” / Anterior Medial Portal Technique:**

It is beyond the scope of this publication to compare and contrast reaming the femoral tunnel via an anteromedial portal or via a transtibial technique. However, one advantage of this technique is that it allows greater flexibility in reaming the two tunnels as reaming the femoral tunnel is not dependent on placement of the tibial tunnel since both tunnels are reamed independently.

The concept and overall technique of using the ENDobutton CL BTB is the same for the anteromedial technique as for the transtibial technique with some minor adjustments – mainly which depth gauge is used.

3. Ream the tibial and femoral tunnels in the usual manner:

Tibial and femoral tunnels are reamed in the usual manner according to the technique used by the surgeon (anteromedial or transtibial reaming). When using the anteromedial technique – either the femoral or tibial tunnel can be reamed first according to surgeon preference. Note – reaming the femoral tunnel through the anteromedial portal can be easier when the knee is flexed beyond 100 degrees.

When reaming the femoral tunnel, place the guide pin through the anteromedial portal and place in the appropriate anatomic position for the femoral tunnel. As a rule, the femoral tunnel will be slightly shorter using this technique in contrast to the transtibial technique. Also in contrast, hyperflexing the knee will allow a longer femoral tunnel and the guide pin to exit the thigh in a more superolateral position vs. a straight lateral position. Doing this will still allow the femoral bone plug to be countersunk allowing the tibial bone plug to be flush with the anterior tibial cortex avoiding any graft-tunnel mismatch or “long grafts”. This technique also eliminates the risk of interference fixation lacerating grafts and bone plugs or causing posterior “blow out” all of which compromise fixation when using interference screws. Ream over the guide pin with the appropriate acorn or low profile reamer. Rather than reaming to the depth of the graft length as with a transtibial technique, simply ream to the lateral femoral cortex.

(Figure 1 – Guide pin in place)
(Figures 2 and 3 – Reaming the femoral tunnel)

If the reamer perforates the lateral femoral cortex, there is no concern as the XTENDOBUTTON can simply be placed over the ENDOBUTTON (see Appendix A). In fact, some surgeons simply ream through the lateral femoral cortex and routinely use the XTENDOBUTTON saving the step of drilling over the guide pin for a standard ENDOBUTTON. Remove the reamer and leave the guide pin in place. Drill over the guide pin through the lateral femoral cortex with the supplied 4.5 mm cannulated ENDOBUTTON drill.
4. Use the appropriate depth gauge and measure from the lateral femoral cortex to the opening of the tibial tunnel:

A straight depth gauge will not work with this technique as the two tunnels are reamed at different angles. Thus, at the time of writing this technique a suture is used to take the place of a straight depth gauge as the suture can easily be placed in the two tunnels to directly measure the total length of the graft – CL construct. We have used one of two instruments to place and hold the suture and both work well. One can use either a modified depth gauge with attached suture or a simple knot pusher with attached suture.

(Figures 6 and 7 – Two different “depth gauges” and attached suture. Suture will be used as depth gauge)

The modified depth gauge is the ENDBUTTON CL depth gauge with a “V” slot in the end. Tie a knot in a light-colored or undyed suture and capture the knot in the “V” leaving the other end free. If using a standard knot pusher, likewise tie a knot in the end of the suture and capture the knot with the knot pusher leaving the other end free. Slide the modified depth gauge or knot pusher through the anteromedial portal and out the femoral tunnel capturing the lateral femoral cortex.
(Figures 8 and 9 – Knot pusher / suture to capture and measure to lateral)

Then grasp the free end of the suture with a suture retriever or crochet hook via the tibial tunnel and bring it out the tibial tunnel.

(Figure 10 – Retrieve free end of suture and bring out the tibial tunnel)

Mark the suture as it exits the tibial tunnel such as marking the suture with a pen or cutting the suture – note I prefer to simply cut the suture.
Now the suture is the depth gauge and the length of the suture will represent the entire length of the graft – CL – ENDobutton construct. The surgeon does NOT need to know this length, measure tunnel lengths, nor do any additions or subtractions in lengths. Simply pass the suture to the technician on the back table who is preparing the graft.

5. Prepare the graft in the usual manner:

The graft is prepared on the back table. Bone plugs are usually 15 mm to 20 mm in length. Crimp the bone blocks to 1 mm less than the tunnel diameter as the bone blocks will expand; crimping the bone blocks 1 mm less than the tunnel diameter will facilitate passage of the graft with ease. The CL can be attached to the graft a few different ways. The preferred method is to attach the CL through a longitudinal drill hole in the femoral bone block. It is a simple / preferred method to free-hand this drill hole using a 2 mm drill bit. The reason this is a relatively simple step is that the femoral bone block has cortical bone on the side of the tendon. The drill will easily follow the cortical bone longitudinally. However, there is a supplied guide to drill this hole longitudinally through the femoral bone plug if desired.

Lay the graft next to the suture with the end of the tibial bone block at one end of the suture. The suture represents the entire length of the graft construct including the CL and ENDobutton. Measure directly the distance from the point of attachment of the
CL on the graft to the other end of the suture – usually around 20 mm to 40 mm.

(Figure 14 – Suture in place measuring entire length of graft / CL construct. Measure the needed length of the CL from point of attachment to end of suture - in this example a 30 mm CL will be needed.)

Note: CL’s come in 5 mm increments. It is best to round down and call for the shorter CL if the measurement is in between sizes.

6. Attach the ENDOBUTTON CL to the graft:

The ENDOBUTTON CL can be divided into three areas: a long loop, a short loop, and the ENDOBUTTON itself.

(Figure 15 – ENDOBUTTON CL BTB)

Trying to push the CL through the drill hole only produces fraying of the CL. Therefore it is advisable to pull the CL through its path with a small nonbraided suture (“pulling suture”). At first it may seem confusing as to the direction to pull the CL through the
bone block. It is easy if one simply knows the path that the CL long loop should be pulled into position. Although this can be done in multiple steps, it is easiest to do this in one simple step. Imagine that the “pulling suture” is going to take the path of pulling the CL long loop into place. To do this easily, pass a suture passer retrograde through the CL small loop and then through the longitudinal drill hole in the bone plug. With the “pulling suture”, capture the CL long loop and then pass the “pulling suture” (using a free needle) through the bone-tendon junction and through the suture passer. Then use the suture passer to pull the “pulling suture” through the bone plug and through the CL small loop. Now the “pulling suture” is on path to pull the CL long loop into position. Note: Be sure the “pulling suture” and subsequent CL long loop will be looped around the cortical bone of the bone plug. Looping the CL around the cancellous bone only risks fracture of the bone block. Pull the “pulling suture” and subsequent CL long loop through the bone-tendon junction, through the longitudinal hole in the bone plug, through the small loop, and finally around the ENDOBUTTON in one step. Tighten the construct.

(Figures 16 and 17 – Suture passer passing through small continuous loop, bone block, and tendon)

(Figures 18 and 19 – Place a passing suture around the long loop of the ENDOBUTTON CL BTB)
This method of attaching the CL to the bone block has been showed to be very accurate and breakage of the bone block has not been an issue. In addition, attaching the CL via this method allows the CL to guide the bone plug up both tunnels and into position without the need for additional guiding sutures. However, if the surgeon is uncomfortable with this method of attaching the CL to the bone block (example if the bone quality is poor as seen occasionally with elderly allograft bone), the CL can be passed around the bone-tendon junction only or directly through a transverse drill hole through the bone block (through the cortical bone for strength).
All methods of attaching the CL to the graft have shown excellent pull-out strengths. If the later two methods are used, the surgeon may prefer to also place a “guiding suture” through the bone plug to guide the femoral bone plug through the tunnels.

This method also allows the total length of the graft to be easily checked along the suture used as the depth gauge to assure the total length of the construct has remained consistent and accurate.

(Figures 25 and 26 – Easily checking entire length of construct against marked suture to confirm length)

Place a suture through each eyelet of the ENDOBUTTON. It is preferred to use a strong suture (such as a #5 suture) as the leading suture through one of the eyelets and a smaller suture (such as a #2 suture) as the trailing suture though the other eyelet.
7. **Pass the graft and secure the femoral bone plug:**

   Place a passing pin through the anteromedial portal, through the femoral tunnel, and out the lateral femoral cortex / lateral thigh. Do not attach the ENDOBUTTON sutures directly to the passing pin but rather use a passing suture for this. Pull passing suture into position via passing pin.

(Figure 27 – Two sutures placed through the ENDOBUTTON)

(Figure 28 – Passing pin in place)

(Figure 29 – Passing suture pulled through femoral tunnel)
Using a suture retriever or crochet hook through the tibial tunnel, pull the loop of the passing suture out of the tibial tunnel.

(Figure 30 – Passing suture pulled out tibial tunnel and now in position to pull graft through both tunnels and into position)

Then use the passing suture to pull the leading and trailing ENDBUTTON sutures through the tibial tunnel, then the femoral tunnel, and out the lateral femoral cortex / lateral thigh.

(Figures 31 and 32 – Passing suture ready to pull ENDBUTTON sutures through bone tunnels)
Pull the graft through the two tunnels and into position with the ENDOBUTTON out the lateral femoral cortex.

(Figures 33 and 34 – Pulling graft into position and ENDOBUTTON out lateral femoral cortex)

Flip the ENDOBUTTON on the outside of the lateral femoral cortex. This has a definite and easy feel – the ENDOBUTTON will rock easily confirming it is not still within the femoral tunnel. In other words, if the ENDOBUTTON is not felt to flip and rock easily, most likely is still within the femoral tunnel.
This is also confirmed easily as the surgeon will see the tibial bone block countersunk approximately 10 mm while the button is flipped. Pull back on the graft and tension the construct. There is a definite “stop” when the graft is tensioned and the tibial bone block will lay flush with the tibial cortex.
8. **Secure the tibial bone plug:**
   Secure the tibial bone block per surgeon preference.

(Figure 38 – Final graft in position and secured)

**Transtibial Technique:**

The concept and overall technique of using the ENDOBUTTON CL BTB is the same for the anteromedial technique as for the transtibial technique with some minor adjustments – mainly which depth gauge is used.

3. **Ream the tibial and femoral tunnels in the usual manner:**
   Tibial and femoral tunnels are reamed in the usual manner according to the technique used by the surgeon (anteromedial or transtibial reaming). When using a transtibial technique – the tibial tunnel is reamed before the femoral tunnel.
   Measure the total length of the graft.

(Figure 39 – Measure total length of graft to 80 mm).

Graft lengths are approximately 80 mm in length when using a BTB graft. After reaming the tibial tunnel, place a guide wire in the appropriate position to ream the femoral tunnel. Personally, when using this technique, I use a 6 mm offset guide and rotate it down to the anatomic position for the femoral attachment.
Indeed this may create a more oval opening of the femoral tunnel but this will allow the graft to enter the femur in an anatomic position. Second look arthroscopy and CT scan studies have shown this tunnel to heal in well with 360 degree appositional healing of the graft.

Ream the femoral tunnel with the appropriate acorn reamer to a length measured directly at the opening of the anterior tibial tunnel – the surgeon does not need to know the length of the femoral tunnel. Ream an extra 10 mm to give the ENDOBUTT0N room to flip easily over the lateral femoral cortex. Example; if the graft length is 80 mm, ream to 90 mm as measured directly off the reamer at the opening of the tibial. The reamer represents where the graft will be positioned assuring the tibial bone plug will lay flush with the anterior tibial cortex at the opening of the tibial tunnel. This avoids problems such as graft-tunnel mismatch or “long grafts”.

(Figure 41 - After reaming both the femoral and tibial tunnels)
(Figure 42 – Reaming femoral tunnel to the depth of the graft length plus 10 mm to allow the ENDOBUTTON to flip on the outside of the lateral femoral cortex, as measured at the opening of the tibial tunnel. In this example - graft length is 80 mm thus ream to 90 mm as measured at the opening of the tibial tunnel as marked with blue marker for clarity)

Note: Do not ream through the femoral cortex when using the standard ENDOBUTTON as this will compromise fixation. However, if the surgeon does ream through the lateral femoral cortex, the solution is simple as the XTENDOBUTTON is simply placed over the standard ENDOBUTTON (see Appendix A). Of note, some surgeons prefer to simply ream through the lateral femoral cortex and routinely use the XTENDOBUTTON eliminating the step of drilling over the guide wire with the 4.5 mm cannulated drill bit. Flexing the knee less than 90 degrees will lengthen the femoral tunnel decreasing the risk of perforating the lateral femoral cortex. Be certain the guide wire does not exit the thigh too far proximal as this will risk the guide wire piercing the tourniquet / leg holder.

Perforating the posterior cortex or leaving a “thin wall” of the femoral tunnel will not compromise fixation as it would when using interference fixation. This technique also does not put the graft at risk of laceration or breakage of the femoral bone block when placing an interference screw.

After reaming the femoral tunnel, leave the guide pin in place. Drill over the guide pin with the supplied 4.5 mm cannulated drill bit through the lateral femoral cortex
This will allow the ENDBUTTON to be brought out the lateral femoral cortex.
Remove the guide pin.

4. Use the appropriate depth gauge and measure from the lateral femoral cortex to the opening of the tibial tunnel:

   Measure the distance from the lateral femoral cortex to the opening of the tibial tunnel using the supplied straight depth gauge with stop. Set the stop at the opening of the tibial tunnel.

This represents the total length of the graft / CL construct. The surgeon does NOT need to know this length, tunnel lengths, nor do any additions or subtractions in lengths. Simply set the stop and hand it off to the back table for the technician who is preparing the graft.

5. Prepare the graft in the usual manner:
The graft is prepared on the back table. Bone plugs are usually 15 mm to 20 mm in length. Crimp the bone blocks to 1 mm less than the tunnel diameter as the bone blocks will expand; crimping the bone blocks 1 mm less than the tunnel diameter will facilitate passage of the graft with ease. The CL can be attached to the graft a few different ways. The preferred method is to attach the CL through a longitudinal drill hole in the femoral bone block. It is a simple / preferred method to free-hand this drill hole using a 2 mm drill bit. The reason this is a relatively simple step is that the femoral bone block has cortical bone on the side of the tendon. The drill will easily follow the cortical bone longitudinally. However, there is a supplied guide to drill this hole longitudinally through the femoral bone plug if desired.

(Figures 45 and 46 – Drilling longitudinal hole in femoral bone plug - either free-hand or with guide)

Lay the graft next to the depth gauge with the end of the tibial bone block at the point of the stop on the depth gauge. The tip of the depth gauge to the stop represents the desired length of the graft construct including the CL and ENDOBUTTON. Measure directly the distance from the point of attachment of the CL on the graft to the tip of the depth gauge – usually around 30 - 45 mm.

(Figure 47 – Determination of continuous loop length at 30 mm)

Note: CL’s come in 5 mm increments. It is best to round down and call for the shorter CL if the measurement is in between sizes.

6. Attach the ENDOBUTTON CL to the graft:

The ENDOBUTTON CL can be divided into three areas: a long loop, a short loop, and the ENDOBUTTON.
Trying to push the CL through the drill hole only produces fraying of the CL. Therefore it is advisable to pull the CL through its path with a small nonbraided suture ("pulling suture"). At first it may seem confusing as to the direction to pull the CL through the bone block. It is easy if one simply knows the path that the CL long loop should be pulled into position. Although this can be done in multiple steps, it is easiest to do this in one simple step. Imagine that the "pulling suture" is going to take the path of pulling the CL long loop into place. To do this easily, pass a suture passer retrograde through the CL small loop and then through the longitudinal drill hole in the bone block. With the "pulling suture", capture the CL long loop and then pass the "pulling suture" (using a free needle) through the bone-tendon junction and through the suture passer. Then use the suture passer to pull the "pulling suture" through the bone plug and through the CL small loop. Now the "pulling suture" is on path to pull the CL long loop into position. Note: Be sure the "pulling suture" and subsequent CL long loop will be looped around the cortical bone of the bone plug. Looping the CL around the cancellous bone only risks fracture of the bone block. Pull the "pulling suture" and subsequent CL long loop through the bone-tendon junction, through the longitudinal hole in the bone plug, through the CL small loop, and finally around the ENDOBUTTON in one step. Tighten the construct.
This method of attaching the CL to the bone block has been showed to be very accurate and breakage of the bone block has not been an issue. In addition, attaching the CL via this method allows the CL to guide the bone plug up both tunnels and into position without the need for additional guiding sutures. However, if the surgeon is uncomfortable with this method of attaching the CL to the bone block (Example: if the bone quality is poor as seen occasionally with elderly allograft bone), the CL can be
passed around the bone-tendon junction only or directly through a transverse drill hole through the bone block (through the cortical bone for strength).

(Figure 57 – Alternate methods of attaching the CL)

All methods of attaching the CL to the graft have shown excellent pull-out strengths. If the later two methods are used, the surgeon may prefer to also place a “guiding suture” through the bone plug to guide the femoral bone plug through the tunnels.

This method also allows the total length of the graft to be easily checked along the depth gauge to assure the total length of the construct has remained consistent and accurate.

(Figure 58 – showing the graft / CL construct against the depth gauge confirming the length of the construct to 30 mm)
Place a suture through each eyelet of the ENDOBUTTON. It is preferred to use a strong suture (such as a #5 suture) as the leading suture through one of the eyelets and a smaller suture (such as a #2 suture) as the trailing suture through the other eyelet.

(Figure 59 – Two sutures placed through the ENDOBUTTON).

7. **Pass the graft and secure the femoral bone plug:**

   Place a passing pin through the tunnels and out the lateral femoral cortex / lateral thigh. Using the passing pin, pull both the leading and trailing sutures out the lateral thigh.

(Figure 60 – showing the passing pin in place with the two sutures through the pin – then show the sutures pulled into position out the lateral thigh)
Pull the graft through the two tunnels and into position with the ENDOBUTTON out the lateral femoral cortex.

(Figure 61 - ENDOBUTTON pulled through the lateral femoral cortex and into position to be flipped)

Flip the ENDOBUTTON on the outside of the lateral femoral cortex. This has a definite and easy feel – the ENDOBUTTON will rock easily confirming it is not within the femoral tunnel. In other words, if the ENDOBUTTON is not felt to flip and rock easily then it most likely is still within the femoral tunnel. This is also confirmed easily as the surgeon will see the tibial bone block countersunk approximately 10 mm while the button is flipped. Pull back on the graft and tension the construct. There is a definite “stop” when the graft is tensioned and the tibial bone block will lay flush with the tibial cortex.

(Figure 62 – Tibial bone plug lies flush with the tibial cortex once the graft is tensioned)
8. Secure the tibial bone plug:

Secure the tibial bone block per surgeon preference.

(Figure 63 – Final graft in position and secured)

APPENDIX A: Using the XTENDOBUTTON:

(Figure 64 – showing the XTENDOBUTTON)

The standard ENDOBUTTON is designed to capture the lateral femoral cortex through a 4.5 mm drill hole. However, the acorn reamer used to ream the femoral cortex may be passed through the lateral femoral cortex. This may be done inadvertently, for revision surgery, or often per surgeon preference eliminating the step of over-drilling the guide wire with the 4.5 mm drill bit. This technique is more commonly used when reaming the femoral tunnel through the anteromedial portal as the femoral tunnel length is often shorter than a traditional transtibial technique. This does not compromise fixation. However, the standard ENDOBUTTON is not large enough to capture the lateral femoral cortex with the larger hole (usually 10 mm) exiting the lateral femoral cortex. Simply slip the larger XTENDOBUTTON over the standard ENDOBUTTON.
(Figure 65 and 66 – Placing the XTENDOBUTTON over the standard ENDOBUTTON)

This creates a larger ENDOBUTTON that will capture the lateral femoral cortex outside the larger drill hole.

(Figure 67 – XTENDOBUTTON over the lateral femoral cortex and larger hole)

Note: Do not let the entire femoral bone plug to be pulled out the lateral femoral cortex. A trick that I use is to place a clamp on the sutures attached to the tibial bone plug. The surgeon can control how far the graft is pulled into position. Specifically, I clamp the sutures roughly 10 mm distal to the tibial bone plug preventing the graft from being pulled through the tunnels too far avoiding the femoral bone plug from being pulled all the way through the lateral femoral cortex. Flip the XTENDOBUTTON outside the lateral femoral cortex in the same manner as the ENDOBUTTON. Tension the graft and secure the tibial bone plug.