Arthroscopic-Assisted Anterior Cruciate Ligament Reconstruction Using Patellar Tendon Autograft Substitution—Two-Incision Technique

James D. Ferrari, M.D., Charles A. Bush-Joseph, M.D., and Bernard R. Bach, Jr., M.D.

Summary: Anterior cruciate ligament (ACL) reconstruction using a two-incision technique and bone-patellar tendon-bone (BPTB) autograft is a widely accepted means of restoring anterior stability to the knee. Results using the two-incision technique are similar to those of the endoscopic technique. Despite the cosmetic appeal of the endoscopic technique, certain clinical situations will dictate the use of the two-incision technique. This article presents our preferred technique for two-incision ACL reconstruction using BPTB autograft. Key Words: ACL reconstruction—Two-incision technique—Bone-patellar tendon-bone autograft.

Techniques for reconstruction of the anterior cruciate ligament (ACL) have rapidly evolved since the mid-1980s. Many graft sources and various means of fixation are available for use, with autogenous bone-patellar tendon-bone (BPTB) remaining the most common graft chosen for reconstructing the ACL-deficient knee. The BPTB graft has had widespread use as a result of its strength, operatively accessible anatomy, and the secure fixation that can be achieved with interference screws.\(^8\,18\,22\) Initially performed through an arthrotomy,\(^8\,16\) ACL reconstruction with BPTB autograft is most commonly done today with a single-incision, endoscopic technique.\(^12\) Nevertheless, the two-incision arthroscopically assisted technique continues to remain popular among many knee ligament surgeons and is an entirely acceptable and predictable method for reconstruction. The senior surgeons (BRB and CBJ) performed this technique routinely between 1986 and 1991 before making a transition to an endoscopic technique. In our follow-up studies, comparative results at similar time intervals were alike. The major apparent advantages to the endoscopic technique in our opinion include a shorter operating time, less postoperative morbidity secondarily, and a quicker recovery of motion in the early postoperative period. For the surgeon who is adept with the two-incision technique, one must weigh the potential learning curve inherent in the transition to a different technique. In our opinion, for the surgeon who infrequently performs ACL reconstructive surgery arthroscopically, the potential pitfalls inherent with the endoscopic technique may not justify transition to the endoscopic procedure.

Despite the current popularity and cosmetic appeal of endoscopic ACL reconstruction, use of and familiarity with the two-incision technique is required in certain operative situations. When the femoral tunnel has perforated through the posterior wall causing a "blow out," interference screw fixation can still be used with the BPTB graft by using the "over-the-top" drill guide and a two-incision technique.\(^1\,2\) In certain revision situations, one may be unable to use an endoscopic technique, and a two-incision approach may allow for proper graft placement and interference screw fixation.\(^1\,2\,24\)

PATIENT POSITIONING AND ARTHROSCOPIC SET-UP

The patient is placed in the supine position. A thorough examination under anesthesia is performed, including Lachman, anterior and posterior...
drawer, varus/valgus, and pivot shift testing before placing the leg in a leg holder. Fixation of the thigh in the leg holder may negate the pivot shift phenomenon; the examination should be performed before securing the thigh in the leg holder. Evaluation of external rotation at 30° and 90° of flexion is done to assess for posterolateral instability. Findings are compared with the contralateral knee. If pivot shift testing clearly demonstrates ACL insufficiency, the BPTB graft may be procured before diagnostic arthroscopy so that the inferolateral and inferomedial portals can be placed through the operative wound.

A padded tourniquet is placed on the upper thigh and a leg holder or lateral post may be used. If a leg holder is used, the contralateral leg is placed in a padded foot holder with the hip and knee slightly flexed, the foot of the table is then fully flexed, and the waist is flexed to minimize lumbar extension. The leg holder may prevent unrestricted access to the lateral thigh exposure, however. In the endoscopic technique, it is necessary to ensure 110° of flexion for proper drilling of the femoral tunnel and femoral screw placement, whereas in the two-incision technique, graft passage and fixation may be performed with the knee flexed between 45° and 60°. One gram of a first-generation cephalosporin (for example, cefazolin) is given intravenously or 600 mg clindamycin or 1 g vancomycin if the patient is allergic to penicillin.

The leg is then prepped and draped. All portal sites and the anterior wound are infiltrated with 0.5% marcaine with epinephrine (1:200,000 dilution) in the subcutaneous tissue. For diagnostic arthroscopy, a superomedial or superolateral portal for outflow is initially established. Historically, gravity inflow was used. Currently an arthroscopic pump is used, and the Y cannula is placed through the portal with the pressure and outflow tubing attached. Use of the pump has nearly eliminated the need for intraoperative use of a tourniquet. An inferolateral portal is used for arthroscope placement, and an inferomedial portal is established as a working portal. Inflow is attached to the arthroscope’s sheath.

**DIAGNOSTIC ARTHROSCOPY**

A thorough diagnostic arthroscopic evaluation of the suprapatellar pouch, patellofemoral joint, medial and lateral gutters, medial and lateral compartments, and the intercondylar notch is performed. The menisci are carefully evaluated for the presence of tears. Vascular zones are assessed and attempts are made to repair full-thickness longitudinal and bucket-handle tears. An inside-out technique is used. Small tears less than 1 cm and stable to probing are left alone, as are partial thickness tears. All articular cartilage injuries are noted. The intercondylar notch is visualized and the damaged ACL is evaluated for injury location. The presence of the vertical strut and empty lateral wall signs are noted as well.

**GRAFT HARVEST**

As mentioned above, if examination under anesthesia clearly demonstrates ACL insufficiency, the graft is harvested before diagnostic arthroscopy. This allows for the assistant to prepare the graft while diagnostic arthroscopy is performed, and the inferomedial and inferolateral portals may be made through the incision, eliminating the need for separate portal incisions. The incision (Fig. 1) is made from the tip of the patella to 2 cm distal to the tibial tubercle, slightly medial to the midline so the

---

**FIG. 1.** Illustration of a right knee. The incision is from the tip of the patella to just below the tibial tubercle, slightly medial to the midline to improve access to the entrance of the tibial tunnel. The graft's bone plugs are harvested with an oscillating saw. The patellar plug is trapezoidal on profile whereas the tibial plug is an equilateral triangle on profile. (Reprinted from Hardin GT, Bach BR, Bush-Joseph CA, et al. Endoscopic single incision ACL reconstruction using patellar tendon autograft: surgical technique. *Am J Knee Surg* 1992;5:144–55.)
tibial tunnel can be placed through the incision. A smaller, more cosmetic incision may be used if adequate skin mobility is present. Some surgeons prefer two transverse mini-incisions. The incision is carried down sharply to the peritenon which is incised with a No. 15 scalpel blade. This is then extended proximally and distally with Metzenbaum scissors and retracted medially and laterally to fully expose the patellar tendon. The width of the tendon is measured and documented in the operative dictation. The midline is marked both proximally and distally with a sterile marking pen. A No. 10 scalpel blade is used to incise the tendon. A 10-mm wide tendon with 10-mm × 25-mm bone plugs is planned. Flexing the knee places the tendon on tension, which helps guide the scalpel down the longitudinal axis of the tendon fibers by keeping the tendon on tension, whereas extending the knee facilitates incising the patellar and tibial bone block edges. Placing a retractor distally helps prevent inadvertent extension of the distal aspect of the skin incision when outlining the tibial bone block with the scalpel. The other side of the graft is then incised with the scalpel, paying careful attention to remain parallel with the opposite side of the graft’s fibers. The distal cross-cut is then outlined on the tibia. An oscillating saw with a No. 238 saw blade is used to create the tibial plug. With the saw in the surgeon’s dominant hand, the nondominant thumb is used to stabilize the saw and the nondominant index finger is placed in the axilla between the inner and outer aspects of the graft to prevent inadvertent graft damage. The tibial cortex is scored and an equilateral triangle (on profile) is made with the saw to maximize the remaining bone in the tubercle region beneath the medial and lateral thirds of the remaining patellar tendon (Fig. 2). The distal cross-cut is then made with the saw blade held 45° oblique to the cortex with the corner of the blade used to cut the bone on each side of the tibial plug. Half-inch and quarter-inch curved osteotomes are used to gently lift the tibial plug out of its bed without levering. The tibial plug is then grasped with a lap pad, tension is applied, and the fat pad is dissected from the graft with Metzenbaum scissors. By applying traction on the graft, the patella can be brought into the wound minimizing the extent of the proximal incision. The scalpel is then used to outline the patellar bone plug, and the oscillating saw is used to score the patellar cortex. A trapezoidal graft (on profile) is then taken to avoid penetrating the articular cartilage (Fig. 1). Once again the proximal cross-cut is made holding the saw blade at a 45° angle, and then the blade is placed parallel into the medial and lateral bone cuts to complete the cross-cut. The osteotomes are again used to lift the graft from its host bed without levering. Excessive levering may result in an intraoperative patellar fracture which is generally sagittally oriented. Excessive cross-hatching of the corners may create a stress riser which could contribute to the potential of a postoperative patellar fracture; these fractures generally have a transverse fracture pattern. Some surgeons will taper the bone plug to theoretically reduce stresses within the patella. Other surgeons harvest a semicircular or oval graft on cross-section using commercially available instrumentation. Remaining fat pad and synovium is removed with the Metzenbaum scissors, and the graft is taken to the back table for preparation.

**GRAFT PREPARATION**

At the back table, the graft is first measured for length of the bone blocks, the tendinous portion, and total length. Ideally, 10-mm × 25-mm bone plugs have been harvested. A small rongeur is used to contour the bone plugs and the excess bone that is removed is saved. Alternatively, one could use a small burr to shape the plug or use bone compaction pliers to compress or shape the plug. A small extension of bone is often present proximal to the tendon insertion into the tibial bone plug and
should be removed so the bone edge is flush with the tendinous insertion. Removal of this tip of bone is important because it can catch within the joint if one has to remove and fine tune the graft during surgery. If one side is 11 mm wide, it can be used for the tibial tunnel side if the graft is passed retrograde or for the femoral tunnel side if the graft is passed antegrade. A 0.062-in K-wire is used to make two drill holes in each bone plug, angled obliquely through the cancellous portion of the graft into the cortical surface. A No. 5 Ticon suture is placed in each hole. The hole is drilled obliquely to ensure that cortical bone will prevent the suture from sawing through cancellous bone when tension is applied, and the oblique nature of the suture’s path helps prevent cutting of the suture when interference screws are placed.

NOTCH PREPARATION AND NOTCHPLASTY

Intercondylar notch preparation is performed while the graft is being prepared at the back table. Evaluation of notch configuration and the presence of tibial eminence and notch wall osteophytes is noted. Whereas significant notch width variability may be encountered, 20–22 mm is required to avoid graft impingement. Removal of the ligamentum mucosum from the notch apex facilitates visualization, and it may be necessary to debride the fat pad. The remaining ACL tissue is removed with the combination of arthroscopic scissors, arthroscopic osteotome, and motorized 5.5-mm full-radius resector. The tibial footprint of the ACL may be left to help facilitate tunnel placement. All soft tissue is removed from the lateral wall of the notch (Fig. 3). Synovium overlying the posterior cruciate ligament (PCL) laterally may be removed to help visualize the posterior notch. This can often create bleeding that requires hemostasis with electrocauterization. The notchplasty is performed for two purposes. First, it promotes visualization of the over-the-top position and accurate placement of the femoral tunnel. Second, it helps prevent impingement of the graft with the knee in full extension. The notchplasty is performed with a motorized 5.5-mm spherical burr, moving from anterior to posterior and from apex to inferior, with careful attention paid to avoid misinterpreting a vertical ridge two-thirds posteriorly as the true posterior outlet (Fig. 4). When the ridge is identified, the burr can be placed posterior to the ridge and moved from a posterior to anterior direction to smooth it. A curette can be used to remove soft tissue from the posterior outlet, and a probe is used to hook over the posterior edge at the over-the-top position. A minimal amount of bone should be removed from the femoral ACL insertion to avoid lateralizing the isometric point.

TUNNEL PLACEMENT

Historically, our normal sequence of events was to: (1) place our tibial guide pin, (2) perform the lateral approach for femoral tunnel placement and
place the femoral guide pin, (3) drill the femoral tunnel, and (4) drill the tibial tunnel. We preferred to prepare the femoral tunnel before the tibial tunnel to better maintain knee joint distention, allowing improved visualization of the femoral socket's integrity. For purposes of clarity, we will discuss femoral tunnel placement first and then tibial tunnel placement. However, if we were performing a two-incision technique today, we would probably create our tibial tunnel initially and use the femoral endoscopic aimer to create a pilot hole on the femur. This would allow us to more easily and accurately create the femoral tunnel.

**FEMORAL TUNNEL PLACEMENT**

A lateral skin incision is made over the midportion of the iliotibial band, from the lateral femoral epicondyle distally extending 4 cm proximally (Fig. 5). The ITB is split in line with its fibers 2 cm anterior to its posterior edge. The vastus lateralis is then elevated from posterior to anterior off the lateral intermuscular septum and femur, and a Chandler or Z retractor is placed over the anterior femur to retract the extensor mechanism. The superior lateral geniculate vessels require electrocauterization, because they may be a source of postoperative bleeding or hematoma. Care must be taken to avoid injury to the lateral collateral ligament origin at the flare of the metaphysis. The entry point should always be proximal to the origin of the ligament (Fig. 6). Blunt dissection with a finger and 0.75-in Cobb elevator subperiosteally allows for palpation of the posterior intercondylar notch (Fig. 7). A J-passer is placed through the inferomedial portal or midpatellar opening to the over-

**FIG. 5.** Photo of a right knee depicting the lateral incision for placement of the femoral tunnel. The iliotibial band is exposed.

**FIG. 6.** Bart model of a right knee. The bullet tip of the femoral drill guide is placed at the flare of the metaphysis. This point is always proximal to the lateral collateral ligament.
should be identical. This is an important concept to recognize, particularly in revision situations.

**TIBIAL TUNNEL PLACEMENT**

Several commercially available tibial tunnel guide systems are available for use in drilling the tibial tunnel. Although it is less crucial in the two-incision technique, an attempt is made to optimize graft and tunnel length matching. The “n + 7” rule is helpful, whereby 7° is added to the length of the tendinous portion of the graft, producing the setting for the guide. For instance, if the tendon measures 48 mm in length, 7 is added to make 55 and the guide is set at 55°. Several parameters are used to determine guide pin placement. By using the tibial insertion footprint, ideally the guide pin should pierce the tibial cortex in the middle of the former ACL mid-third region. Placement should also be guided by following the contour of the posterior edge of the anterior horn of the lateral meniscus to the midpoint of the notch. This is just lateral to the medial tibial spine. Lastly, the guide pin should be entering the joint 7 mm anterior to the PCL. It should be kept in mind that because of soft tissue overlying the tibial plateau, where one sees the pin enter the joint is not necessarily where it exits the plateau surface. For this reason, erring more posteriorly prevents unwanted anterior tunnel placement. This, along with prevention of intercondylar notch “cyclops lesions,” is the purpose for debriding the ACL stump. We prefer to debride the former ACL directly to bone to allow for accurate placement of the tibial pin. In the coronal plane, the tunnel should be midline in the notch. Erring slightly medial helps prevent impingement from the lateral femoral condyle.

Each commercially available tibial tunnel guide system has inherent peculiarities. The Acufex Protrac (Smith & Nephew Endoscopy, Mansfield, MA, U.S.A.) tibial guide aimer is placed through the inferomedial portal and the anatomic reference points discussed above are used to appropriately place the guide stylet (Fig. 12). As the guide pin contacts the aimer above the surface of the plateau, the point is placed 3–4 mm more posteriorly to prevent anterior tunnel placement. The pointing arm of the aimer is placed parallel to the articular surface. In cases of patella alta when the anteroinferior portals are high

**FIG. 7.** Photo of a right knee. A Cobb elevator is being used to reflect the vastus lateralis from posterior to anterior to expose the lateral condyle. (Reprinted from Bach BR Jr. Arthroscopy-assisted patellar tendon substitution for anterior cruciate ligament insufficiency: surgical technique. *Am J Knee Surg* 1989;2:3–20.)

**FIG. 8.** (A and B) Photos of the right knee. The J-shaped passer is brought out the incision from within the knee and “over-the-top” and is used to grasp the stylet of the aiming guide. The stylet is then brought into the joint by the passer and the bullet tip of the aiming guide placed down on the femoral cortex (B). (Reprinted from Bach BR Jr. Arthroscopy-assisted patellar tendon substitution for anterior cruciate ligament insufficiency: surgical technique. *Am J Knee Surg* 1989;2:3–20.)
relative to the articular surface, parallel placement of the point arm may be impeded by the soft tissues. It may be advisable to make an accessory inferomedial portal to ensure parallel orientation of the aimer arm thus assuring a steep tibial tunnel. The distal soft tissue is retracted and the cannulated guide arm of the aimer is slid up to the tibial cortex, 1.5 cm medial to the tibial bone plug site, 1 cm above the pes anserine tendons. A guide pin is placed through the guide arm and is drilled into the joint. After the pin penetrates the joint, the guide is removed, the pin is checked for orientation and placement, and the leg is extended to ensure impingement-free extension. In extension this pin should clear the intercondylar apex by 3–4 mm. Slight alterations in pin placement may be done by free-hand drilling of another guide pin held tightly with Kocher clamps against the first pin with appropriate adjustments made in the anterior–posterior and medial–lateral planes (Fig. 13). With the knee flexed, the guide pin is then tapped retrograde to engage the femoral intercondylar notch roof. This prevents anterior displacement of the head “endooscopic” reamer when it enters the joint and subsequent creation of a posterior ridge in the tibial tunnel, which may cause undesirable anterior displacement of the graft within the tibial tunnel as well as difficulty in passing the graft. This step is unnecessary if a cylindrical “core” cannulated reamer is used. The soft tissue around the guide pin is incised with electrocautery and elevated with a Cobb elevator. Depending on the graft size, a 10- or 11-mm cannulated reamer is placed over the guide pin and reamed. Bone reamings are collected with a cannulated bone chip harvester (Linvatec, Largo, FL, U.S.A.) and used for grafting of the patellar and tibial bone plug defects. Before entering the joint, the arthroscopic pump is turned off. The reamer and guide pin are removed and the tip of the guide pin is inspected. The posterior intra-articular edge of the tibial tunnel may be smoothed if needed with a chamfer reamer and/or arthroscopic rasp (Fig. 14). A plug is placed in the tunnel and the pump turned back on. Loose bone and cartilage around the tunnel entrance are removed with the shaver, and the tunnel is checked for posterior ridges (Fig. 15).

**GRAFT PASSAGE AND FIXATION**

The knee is flexed 60° for graft passage. A Yankauer suction tube is placed retrograde through the tibial tunnel and into the femoral tunnel. Two 22-gauge wire loops are passed antegrade through the suction tube and clamped. The suction tube is then removed. The sutures from the tibial bone block are then separately looped through the wire loops and the wires withdrawn through the tibial tunnel. The sutures are clamped outside the tibial tunnel, and the graft is then drawn into the femoral tunnel (Fig. 16). Alternatively, commercially available silicone tube graft passers may be used. Under arthroscopic visualization, the tibial plug is brought into the tibial tunnel. A probe or hemostat is often needed to manipulate the plug into place. Potential obstructions include the PCL, lateral femoral wall, and intercondylar eminence. When the tibial plug

---

is in place and the femoral plug within its tunnel, tension can be placed on both sets of sutures to assess for graft laxity. If laxity is present, either plug may be incarcerated within its tunnel, preventing the graft from being fully tensioned. If this is the case, tunnel expansion may be needed. The graft should then be assessed for impingement along the lateral femoral wall and anterior notch. If present, appropriate lateral or anterior notch-plasty is required to prevent fraying of the graft.

The femoral side is secured initially. We prefer interference screw fixation with cannulated interference screws (Linvatec, Largo, FL, U.S.A.). The advantages to interference fixation include increased linear load resistance, stiffness, and tensile strength.\textsuperscript{6,8} We currently do not use bioabsorbable interference screws. Several pitfalls must be avoided. These include graft–screw length mismatch, graft–screw divergence, graft advancement, graft laceration, graft fracture, and suture laceration.\textsuperscript{2} A screw that matches the length of our graft is generally used. Maximum tension is applied to the sutures as the screws are placed to avoid graft advancement. Cannulated screws are used to help prevent divergence. The femoral plug’s cortex is directed laterally with the screw placed against the cortex and a 9-mm screw is used.\textsuperscript{17} If the graft is recessed within the tunnel, a longer screw is used so it can be more readily identified and removed in the future. The knee is cycled through a full range of motion several times, and “gross isometricity” is assessed by applying tension on the tibial plug’s sutures and placing the index finger over the tibial tunnel to feel for suture motion. One millimeter to 2 mm of movement is generally noted in the terminal 30° of extension. The tibial plug is then rotated 90° externally to place the plug’s cortex an-

**FIG. 13.** Photo of a left knee. The shorter pin has been placed intratunnel. A second pin has been placed medial to the first to position the guide pin slightly more medially. Two Kocher clamps ensure that the second pin is drilled parallel to the first. When accurate placement of the second pin is confirmed, the first pin is removed.

**FIGS. 14 and 15.** (14) Illustration of a right knee. After the tibial tunnel has been created, a posterior cortical lip is often present. This is smoothed down with the aid of a chamfer reamer and curved rasp (inset). (15) Illustration of a right knee depicting placement of the femoral and tibial tunnels. (Reprinted from Hardin GT, Bach BR, Bush-Joseph CA, et al. Endoscopic single incision ACL reconstruction using patellar tendon autograft: surgical technique. Am J Knee Surg 1992;5:144-55.)
terior, and a 9-mm screw is placed anterior while the knee is in full extension without a posterior Lachman (Fig. 17). Maximum tension is placed on the tibial plug’s sutures. Fixation in extension avoids overconstraining the knee. One should avoid burying the interference screw intraosseously because screw removal may be difficult in revision cases or if subsequent high tibial osteotomy is required. Lachman testing should reveal 2–3 mm of translation with a firm end point. The graft is then viewed with the arthroscope and is probed to ensure proper tension, especially at 30° of flexion. If this is not the case, it is likely that the tibial plug has advanced toward the joint and the screw should be removed and placed again. A final assessment of graft impingement is performed at this time.

**CLOSURE**

The lateral wound is closed with interrupted No. 1 Vicryl suture for the iliotibial band, 2-0 Vicryl suture for the subcutaneous layer, and a running 3-0 Prolene suture for the skin. The patellar tendon defect is reapproximated with three or four interrupted No. 1 Vicryl sutures while the knee is flexed, avoiding excessive shortening of the tendon. The osteoperiosteal flap overlying the tibial drill hole is also closed with No. 1 Vicryl. The patellar bone defect is then grafted with the collected bone remanings, and any remaining bone is used to graft the tibial donor site. The peritenon is then closed with a running 2-0 Vicryl suture, the subcutaneous layer with interrupted 2-0 Vicryl, and the skin closed with a running 3-0 Prolene. Steri-strips are
placed over the wounds, then dry sterile gauze, Kerlex roll, an ice cryotherapy pad, and ace wrap. The cryotherapy pad must not contact the skin or superficial frostbite can occur. The leg is then placed in a hinged knee brace which can be locked in extension.

**REHABILITATION**

An accelerated rehabilitation program is implemented the day of surgery. Surgery is performed on an outpatient basis, and patients are seen in physical therapy before leaving the hospital. Emphasis is placed on achieving full extension with hyperextension eventually equaling the opposite knee. Weight bearing is allowed as tolerated in extension in a hinged knee brace which is worn for 6 weeks with the brace being unlocked or removed for range-of-motion exercises. Crutches are generally discontinued within 1 week. Quad sets, straight leg raises, and prone hangs are initiated on the first day. The goal at 1 week is to achieve full extension and 90° of flexion. A formal physical therapy program is instituted at outside facilities beginning after the sutures are taken out. In general, bicycling is begun by 1 week, stairclimbing machines at 4–6 weeks, light jogging at 12 weeks, and a gradual return to sports beginning at 4 months. A custom ACL orthosis is worn for sports for the first year. This program is not modified for those patients who undergo meniscal repair.

**AUTHORS’ RESULTS**

A recent 5–9-year follow-up study of patients operated on at our institution with the two-incision technique has revealed excellent long-term results (Fig. 18). Eighty-three percent of the 97 patients had a negative pivot shift examination with the remaining 17% having a grade 1+ “slip.” Seventy percent had a <3-mm side-to-side difference on KT-1000 manual maximum side-to-side testing, and functional testing averaged <2% asymmetry for vertical jump, single-legged hop, and timed 6-meter hop. Tegner activity levels were similar to preinjury levels, the mean Lysholm score was 87, and the Noyes sports functional score was 89. A low incidence of patellar pain (13%) on stairclimbing was noted, and no patients exhibited any long-term patellar tendinitis symptoms. Ninety-seven percent of patients were satisfied with the results of the surgical procedure and would have the operation performed if they tore their contralateral ACL. Most importantly, when compared with an earlier 2–4-year follow-up study in the same cohort of patients, the results did not deteriorate with time.

**SUMMARY**

The double-incision arthroscopic-assisted technique for an ACL reconstruction using patellar tendon substitution is an excellent method for reconstructing the knee. Most studies reveal no superior difference when compared with the single-incision endoscopic technique. The double-incision technique is technically easier than the endoscopic technique. We currently use this technique predominantly in revision situations when the previous femoral tunnel has been appropriately placed, and we would consider conversion to a two-incision procedure if we inadvertently blew out the posterior femoral cortex or had inferior femoral fixation.

**REFERENCES**


