

## **Double bundle posterior cruciate ligament tensioning in chronic posterior instability. Description of a new surgical technique.**

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**Introduction.** Isolated Posterior Cruciate Ligament (PCL) injury has traditionally been treated with non-operative management, with good results even in athletes involved in contact sports <sup>1,2,3</sup>, however, some patients may develop symptomatic posterior instability that does not improve with non-surgical treatment and end up being operated on.<sup>4</sup> Ligament reconstruction using tendon autografts or allografts is the treatment indicated by the most majority of orthopedists.

In the last twenty years there has been an improvement in knowledge anatomy and ligament function, which has led to improving the surgical technique with a variety of options using one or two bundles <sup>5,6,7,8,9,10</sup> with trans-tibial technique and “inlay”,<sup>11,12</sup> all inside<sup>13</sup> and in recent years adding ultra-resistant sutures tapes <sup>14,15</sup> to improve the tensile strength of the graft and thus be able to reduce the high rate of residual instability reported in patients<sup>16</sup>.

The PCL has been recognized for its intrinsic healing capacity after rupture, with estimates that up to 72% of injuries show continuity in magnetic resonance studies after six months after the injury<sup>17</sup>, and 48% show a deformed PCL. Bellelli<sup>18</sup>, reports a case series study in ten patients with complete PCL injury, evaluated with magnetic resonance images (MRI), of which five patients showed spontaneous healing without leaving symptoms of instability, and the other five, still healed, generated pain and

instability. Mariani et al, reported another case series study in eighteen patients with PCL rupture who were followed up to a year after the injury with radiological evaluation with stress tests and MRI, finding that in twelve patients (66.6%) the ligament had healed continuously and the displacement measured in millimeters was not more than eight. The remaining six patients had displacements greater than 8 millimeters and associated injuries that evolved with instability and ended in surgery.

The literature publishes several works preserving the remnant <sup>19,20,21</sup> adding an absent or attenuated bundle tendon, showing better results compared to isolated ligament reconstructions, attributing these findings to a protective effect on the graft at the “killer angle”, improving its healing, with a better return to sport due to the preservation of the remaining mechano-receptors <sup>22</sup>.

In the literature there are two reported works that describe the tensioning of the remnant at a distal level in the tibia together with the reconstruction in chronic injuries, showing superior results to the traditional technique<sup>23,24</sup>, however, as far as we know, there is not a single published work that reports the tensioning of the remnant at a proximal level nor associated with a reconstruction or isolated in chronic injuries.

The authors present a new technique not described or reported in the literature that tensions the remnant of the PCL at the level of its proximal femoral insertion in isolation, without adding grafts, in a young patient with a history of trauma of one year of evolution who was he had previously been diagnosed with a Sherman I anterior cruciate ligament (ACL) injury, but during the examination under anesthesia and arthroscopy it was found that his instability was due to a chronic injury to the PCL, which was lax, and that the posterior displacement of the tibia, the ACL was shrunken, regaining tension when the posterior drawer was reduced. The MRI that had been reported with an abnormal-appearing ACL, in the postoperative analysis, an abnormally “wrinkled” PCL was observed in its middle/distal third, but in continuity

inserted on femur and tibia. Once the PCL was tensioned, the posterior drawer was abolished, and the ACL regained its tension.

**Description of the surgical technique.** Patient in supine position with the limb flexed on the table, no use of tourniquet, use of infusion pump and irrigation hose. The isolated tensioning procedure is indicated in symptomatic patients with chronic PCL injuries with the remnant inserted on the femur and tibia, lax, and with a diameter of no less than 80%. In case where the remnant has a smaller diameter, a graft is added to the absent or attenuated bundle (augmentation).

Step by Step:

1. Anterolateral and anteromedial portal cannula placement. Vision through the transpatellar portal.
2. From the anterolateral portal, the tissue of the posteromedial bundle (P.M) is taken from its upper middle third with “Scorpion®” automatic forceps, (Arthrex, FI), using high strength suture #2 FiberWire® (Arthrex, FI) in cinch form.
3. Taking the second cinch of the posteromedial bundle (P.M) most proximal to the femoral insertion. Optionally, part of the anterolateral bundle can be taken as seen in the surgical technical video.
4. From an anteromedial portal, the tissue of the anterolateral bundle (A.L) is taken at its proximal end with “Scorpion®” automatic forceps (Arthrex, FI) with high tension suture # 2 FiberWire®, (Arthrex, FI).
5. Take the A.L bundle again with another high-strength suture if it has only been taken once, to have two sutures, four (4) strands, minimum for each bundle.
6. Disinsertion of the proximal femoral fibers with a dissector in their entire extension.
7. Debridement of femoral footprint with motorized system blade, exposing the bone.
8. Abrasion of the femoral footprint with a round burr of the motorized system to generate bleeding and enhance healing.

9. From the anteromedial portal, making the hole in the center of the anterolateral bundle with a punch up to the laser mark.
10. Passage of the tap through the A.L hole to facilitate entry of the knotless implant.
11. Passage of the sutures through the hole of the knotless implant and entry into the joint, facing the “peek” of the implant with the hole made.
12. Anterior drawer maneuver on the tibia by the assistant, to reduce the posterior drawer, tension the sutures and A.L bundle tissue, and screw the knotless implant “SwiveLock 4.75 mm®”(Arthrex, FI), throughout its entire length. Removal of the implant driver and cutting remain sutures.
13. Through the anterolateral portal, making the hole with a punch in the center of posteromedial bundle up to the laser mark.
14. Passage of the tap through the P.M hole to facilitate introduction of the knotless implant.
15. Passage of the sutures through the P.M hole of the knotless implant and entry into the joint, facing the “peek” of the implant with the hole made.
16. Anterior drawer maneuver on the tibia by the assistant, tension of the sutures, and P.M bundle tissue and screwing the knotless implant SwiveLock® 4.75 mm” (Arthrex, FI) in its entire extension. Removal of the implant driver and cutting remain sutures.
17. Evaluation of appropriate PCL double bundle tensioning and the ACL recover its normal tension.
18. End of the procedure.

**Potential Pitfalls:** Insufficient remnant tensioning and poor fixation.

**Rehabilitation program:** Immediate weight bearing. Keep the knee extension in rest. Muscle strengthening with isometrics. After 10 days start with passive motion, from 0 to 90 in the first month, progressing until complete total flexion in two months. Static bike after 2 months, running after 4 months and slow return to sports at 6 months once the patient has passed all the psychological and physical tests.

**Results.** There are no reports in the literature of this described technique. The senior author (MMA) has performed this procedure since 2018, on 39 patients, of which in 8 it was the only procedure, in 7 patients tensioning of both cruciate was performed, in 10, the same as the previous one plus posterolateral corner reconstruction (PLC), and in 14, combinations of PCL tensioning with other procedures such as ACL reconstruction, PLC, posteromedial plication (PMP) and tibial osteotomy (OT) and whose results will be the subject of a publication.

The described technique reduces morbidity by not removing grafts, not making tunnels, not having to fix the graft on the tibia and femur, in addition, the killer angle to which part of the failures is attributed is avoided, and it has the biological advantages that preserving the remnant maintains anatomical insertions and the original collagen fibers, does not alter its vascular network and preserves the mechano-receptors. The postoperative result of the patient is shown one year after surgery with recovery of mobility and abolition of the posterior drawer, results that have been constant in the majority of the patients operated on and evaluated.

The authors Manuel F. Mosquera Arango and Juan Manuel Mosquera F, (JMM) declare that they have no conflict of interest.

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