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How To Avoid Flexion Contracture after Anterior Cruciate Ligament Reconstruction: An Easy Trick to Perform in The Office

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1. Abstract

1.1. Aims: This study aims to present a quick and effective method for preventing flexion contracture after Anterior Cruciate Ligament (ACL) reconstruction, a common postoperative complication that significantly impacts patient recovery and mobility.

1.2. Methods: We identified patients who achieved full knee extension during ACL surgery but exhibited early postoperative flexion contracture. These patients were assessed for hamstring/quadriceps muscle balance in the prone position. A simple, reproducible technique was implemented in the office to correct the flexion contracture. The method involved progressive distalization of a support point on the proximal tibia, repeated 3-5 times to achieve full knee extension.

1.3. Results: The technique effectively reduced hamstring contracture and restored full knee extension in the identified patients. The intervention was well-tolerated, empowered patients in their rehabilitation process, and could be easily taught for home practice. No additional technical resources were required.

1.4. Conclusion: The presented method is a quick, effective, and easily reproducible technique for preventing flexion contracture in the early postoperative period following ACL reconstruction. It offers a practical solution to improve patient outcomes, reduce rehabilitation frustration, and enhance overall recovery.

1.4. Introduction

Loss of mobility is the most common complication after anterior cruciate ligament (ACL) reconstruction surgery. The incidence ranges from 5-35% depending on the type of repair; Jackson [1] reports a 6% incidence following ACL reconstruction, which increases to 30-57% in cases of multi-ligamentary injury reconstructions [2]. Extension deficit (flexion contracture) has more significant functional repercussions and is less well tolerated as it causes a noticeable limp due to pelvic tilting during plantar support while walking. Additionally, the lack of quadriceps relaxation increases femoropatellar pressure, potentially leading to anterior knee pain [3].

Quadriceps hypotrophy is common in patients with extension deficits. Therefore, as Johnson and Fu [4] established, stiffness should be considered a clinical failure of knee ligament reconstruction. Several causes have been described that can lead to this extension deficit (preoperative, intraoperative, and postoperative). Various technical errors have been identified as contributing to flexion contracture. Sometimes, despite correct surgical

technique and achieving full intraoperative extension, there is a tendency toward flexion contracture observable in early postoperative visits (1-3 weeks). We present a quick and simple way to correct early-onset flexion contracture in the office. This method is effective, empowers the patient in a potentially tedious rehabilitation process, and skillfully rules out any flexion contracture attributable to inadequate surgical technique in ACL reconstruction.

2. Material and Methods

In this article, we present an easy and reproducible way to avoid this flexion tendency in the office within minutes for patients where any failure causing contracture in the immediate postoperative period has been ruled out. The patients we need to identify are those in whom the surgeon achieved complete extension during the surgery and who present a flexion tendency in the early postoperative weeks, having ruled out previously mentioned technical failures. To explore and correctly quantify an extension deficit, we must examine the hamstring/quadriceps muscle balance in a prone position, which should ideally be >70% (5).

3. Results

After confirming the hamstring relaxation deficit that frequently causes flexion, we teach the patient in the office to become aware of the muscle activation and perform the exercise at home, in addition to the prescribed physical therapy treatment. (Figure 1-4).

Figure 1: Initially, we evaluate the patient in the supine position, observing the height of both heels concerning the examination table, paying attention to hamstringcontracture, which will cause flexion due to the imbalance with the quadriceps.

Figure 2: To more accurately quantify the extension deficit, we place the patient inthe prone position, noting increased hamstring muscle tone.

Figure 2B: We place a support point on the proximal tibia, observing how thehamstring contracture that maintained the flexion significantly decreases at rest.

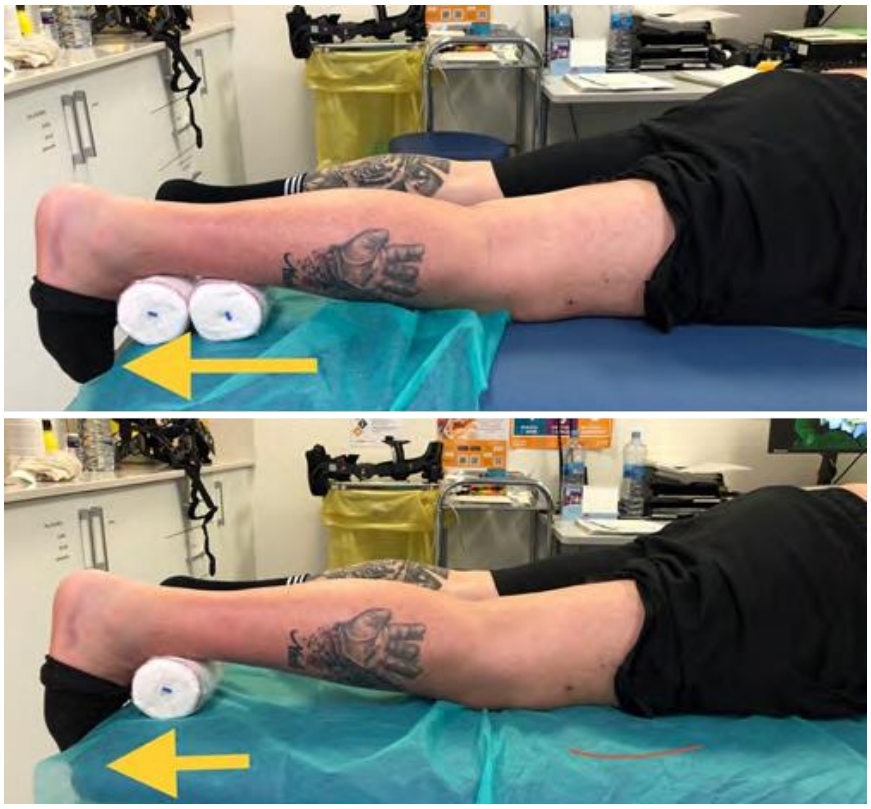

Figure 3: We then progressively distalize the support point, maintaining restintervals in which we confirm the patient maintains hamstring relaxation.

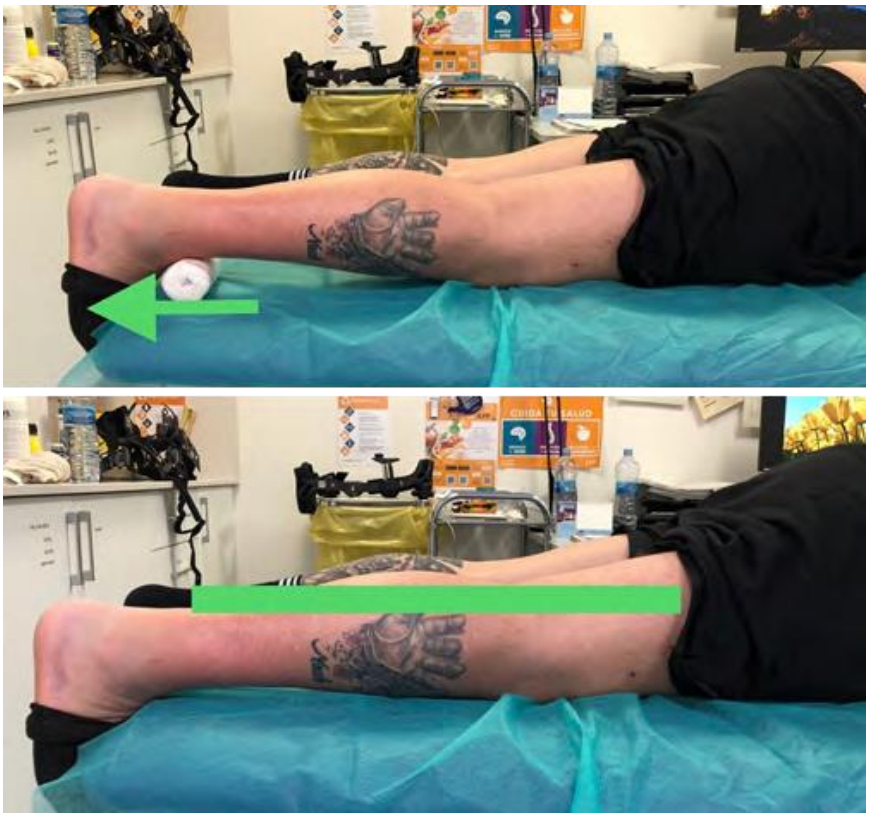

Figure 4: Repeat the process 3-5 times until the limb no longer requires support,achieving full extension.

4. Discussion

Despite correct surgical technique and achieving full knee extension during surgery, many patients show a tendency towards flexion in the early weeks post-surgery. This extension deficit causes many failures: altered gait, femoropatellar pain, dissatisfaction, quadriceps hypotrophy due to difficulty exercising the muscle. Various causes have been described: high femoral blocks (which inhibit the quadriceps Vastus Medialis motor branch), cortical inhibition of the extensor muscles, imbalance between the anterior and posterior chain (quadriceps/hamstrings), pain, excessive hamstring contracture due to weight-bearing protection with crutches during walking.To understand the causes of this complication, we must consider several factors: Preoperatively, several meta-analyses have been published (6) indicating that the chronology of the injury, not the wait time for surgery, is important; the state of the knee, not the number of weeks, determines the delay time (7): recovery of the range of motion including hyperextension (full extension and flexion of about 120º), disappearance of knee inflammation, adequate quadriceps muscle tone, and absence of a limp. These objectives are not always achieved. Moreover, graft selection will also influence the ligamentation process of the graft, particularly sensitive to allografts requiring a more cautious rehabilitation protocol. Animal models have shown that tendinous grafts integrate more slowly compared to bone-incorporating ones [8] (Figure 5). Intraoperatively, tunnel placement is crucial. According to the MARS study, the most common failure in graft placement is in the femoral tunnel with an 80% error rate, while the tibial tunnel error rate is 37% (9). If the femoral tunnel is too posterior, the graft tightens in extension causing flexion contracture and deficit in the last degrees of flexion. Conversely, an excessively anterior tibial tunnel can cause graft impingement in the intercondylar notch, leading to graft irritation, tissue proliferation, and a cyclops lesion, resulting in extension loss [10] (Figure 6 and 7). Postoperatively, after ACL reconstruction, we must understand the chronology of infrapatellar contracture. Paulos (11) describes three phases: a prodromal phase from week 2 to 8 with synovial induration, swelling, pain with limited mobility, and lack of rehabilitation progress; an active phase up to week 20 with increased induration and mobility deficit; and a residual phase up to a year with no inflammation but quadriceps atrophy causing a low patella, Hoffa's fat pad atrophy, and crepitation. Early complications must be optimally addressed in the office to resolve them and prevent clinical deterioration. The most common is hemarthrosis, which, while not having long-term negative effects, can cause pain and mobility loss during the first three months [12]. The most important, and one that can be effectively addressed in the office, is inadequate rehabilitation. Although some techniques aim to achieve proper hamstring relaxation, the methods frequently used to treat flexion caused by muscle imbalance focus on achieving secondary hamstring relaxation through muscle fatigue, often difficult and slow to achieve in athletes and young people, the typical patients requiring ACL reconstruction.

Figure 5: A. Autologous hamstring graft (gracilis and semitendinosus). B. Autologous quadriceps graft type bone-tendon-bone (BTB). C- Heterologousquadriceps graft (cadaver allograft).

Figure 6: Posterior femoral tunnel: causes graft tension in extension, preventingmaximum ranges and possibly causing flexion contracture.

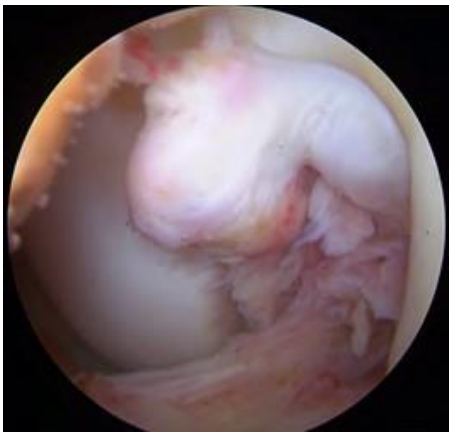

Figure 7: Cyclops lesion: inflammatory tissue proliferation often due to anexcessively anterior tibial tunnel position.

5. Conclusion

Our presented method is quick, effective, easily reproducible in both the office and at home as it does not require technical resources. Moreover, it sets an example for the patient, often reducing frustration from slow recovery and empowering them to continue with the postoperative process.

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