Case Report

Proximal tibiofibular stabilization by anatomical ligamentoplasty and diaphyseal osteotomy of the fibula

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A B S T R A C T

Proximal tibiofibular instability is a rare condition for which treatment is poorly codified. A 21-year-old patient, a leisure sportswoman, presented a post-traumatic anterolateral instability of the proximal tibiofibular articulation without cartilage lesion. We propose an original surgical technique based on a review of the literature that combines an anatomical ligamentoplasty of the proximal tibiofibular joint and a proximal fibular diaphyseal osteotomy to reduce the distal tibiofibular mechanical stresses. This original technique allows a favorable evolution with recovery of professional and sports activities at 6 months.

Introduction

Proximal tibiofibular (PTF) joint instability is a rare condition: only 96 cases have been reported in the published literature.1 The post-traumatic etiology is most frequently reported as that the initial trauma may be unnoticed and therefore absent in the clinical history. The diagnosis is often unknown and delayed due to its variable and often atypical clinical presentation or association with other more obvious lesions.

PTF joint is an arthrodial (sliding movement) joint stabilized by two tibiofibular ligaments, one anterior and one posterior. In some patients, instability will be caused, apart from the triggering trauma, by a rupture of the thinner anterior ligament2 and the oblique orientation3,4 of the joint. Thus, the most frequent form of PTF instability is anterior instability.

Several treatments are reported in the literature,5 ranging from conservative treatment6 to multiple surgical techniques.3,7−11 Arthrodesis1,2 and resection of the head of the fibula3 were the therapies first proposed. A better understanding of the biomechanics of the upper tibiofibular joint has led to improved surgical therapies; nonetheless, no optimal treatment is currently defined in the literature. The objective of our article is to present a clinical case with an original surgical treatment developed based on a review of the current literature, aiming at optimizing the functional outcome.

Case report

A 21-year-old patient, a leisure sportswoman, had been presenting for 10 years with slight pain on the lateral side of her knee during intense physical effort following a fall, for which the initial injury assessment had revealed nothing. For two years, she had also been experiencing abnormal mobility of the proximal fibula, with increasing discomfort. Pain in the activities of daily living and episodes of knee blockage when jumping from the lateral side of the knee gradually appeared.

Clinical assessment showed a dry, mobile, painless knee for flexion/extension movements without any evidence of anomalies of the collateral ligaments, central pivot, or menisci. The discomfort was centered on the PTF joint. Anterior dislocation of the fibular head was observed during forced maneuvers at 90° of flexion (video Appendix). During this maneuver, the patient indicated her discomfort. There was no sign of irritation of the common fibular nerve.

Supplementary video related to this article can be found at https://doi.org/10.1016/j.cjtee.2021.04.006.
X-ray finding was normal. MRI showed a moderate periarticular PTF joint effusion with a normal cartilage appearance. The diagnosis of post-traumatic anterolateral PTF instability according to the Harisson classification\textsuperscript{12} was made.

We proposed a PTF ligamentoplasty procedure to the gracilis tendon to stabilize the joint combined with a proximal fibular diaphyseal osteotomy to limit mechanical stress in the PTF and distal tibiofibular joints.

Our case was approved by the local scientific and ethical committee and the patient gave her written consent.

The ligamentoplasty procedure was performed using a lateral approach centered on the PTF joint. After identification and protection of the common fibular nerve and the lateral collateral ligament plane, the head of the fibula was exposed, as was the lateral tibial plateau of Gerdy’s tubercle to the posterior aspect of the lateral condyle. We made a 3.5-mm anterior-posterior transosseous tunnel in the head of the fibula and the lateral tibial plateau to pass the gracilis tendon harvested by a standard anterior tibial paratuberosity approach through these two tunnels. The gracilis was sutured to itself in the reduced position of the PTF joint (Fig. 1). A short proximal lateral fibular diaphyseal incision was used to make an osteotomy with resection of 2 cm of fibula and local muscle interposition to avoid secondary consolidation (Fig. 2).

This procedure was performed on an outpatient basis. The patient then wore a knee immobilization splint for 6 weeks with complete discharge and progressive rehabilitation from 21 days after surgery onwards to recover joint mobility and muscle capacity.

At 3 months follow-up, the evolution returned to a dry, painless, and mobile knee. The PTF joint was stable during dislocation maneuvers. Mild initial neuropathic pain had quickly subsided. At this time, painlessness and complete support without technical assistance were regained and resumption of work was possible. The resumption of a leisure sports activity at the same level was observed at 6 months.

**Discussion**

Our technique allows an efficient stabilization of the PTF joint with a favorable long-term evolution, shown as Fig. 3. Three other cases of ligamentoplasty technique with grafting have been reported in the literature. One case involved the gracilis tendon\textsuperscript{11} and the other two involved the semitendinosus graft.\textsuperscript{13} None of these cases had an associated proximal fibular osteotomy procedure. They reported good results, with an initial evolution similar to our patient’s (resumption of sports activity at 6 months without pain or recurrence of dislocation). Unlike these three cases, in order to be more economical, we did not use any implantable medical device.

Other techniques proposed in the literature are conservative treatment,\textsuperscript{6} osteosynthesis,\textsuperscript{9} arthrodesis,\textsuperscript{3,7} fibular head resection,\textsuperscript{9} adjustable cortical Endobutton reconstruction,\textsuperscript{4-17} direct ligament repair,\textsuperscript{10} and diversion of the biceps femoris tendon.\textsuperscript{11} In 2017, Kruckeberg et al.\textsuperscript{1} conducted a literature review to analyze all the published cases of PTF joint instability (96 cases in 44 articles). This review revealed that surgical treatment was superior to conservative treatment which exposed the patient to sequelae pain and the risk of recurrence of the dislocation, with residual symptoms in more than 20% of cases. Anatomical ligamentoplasty techniques (such as ours) and diversion of the biceps femoris were the techniques that result in the fewest complications. However, comparison of the results of different articles is impossible due to the heterogeneity of the articles and the small number of patients.

There are, however, some important points for discussion:

- First, respect for anatomy is important for PTF due to the biomechanical relationships between the PTF and distal tibiofibular joints. Any non-anatomical procedure on one of the
The most recent literature focused on three topics that are open to discussion without a validated answer: (1) The new fixation technique thanks to the Endobutton system which appears as an efficient one; (2) The possibility of proposing a treatment for acute cases as we could see in case of Maisonneuve injury with PTF dislocation; and (3) The hoped-for favorable evolution thanks to anatomical reconstruction.

In conclusion, analysis of the literature on the treatment of a PTF instability allowed us to propose an original technique combining anatomical ligamentoplasty with gracilis and proximal diaphysal fibular osteotomy to reduce the constraints on the plasty, resulting in a favorable evolution. This is an efficient and economical technique in cases where conservative treatment of the PTF instability is appropriate.

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**Ethical statement**

This case has been approved by the local scientific and ethical committee and the patient gave her written consent.

**Declaration of competing interest**

The authors declare that they have no competing interest.

**Author contributions**

Choufani Camille participated in the data collection, writing and proofreading of this article. Barbier Olivier participated in the data collection and ethical proofreading of this article. Choufani Camille participated in the data collection, writing and proofreading of this article. Barbier Olivier participated in the data collection and ethical proofreading of this article.

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