

# **Levitation TCU Knee Brace Case Study:**

## **18-Year-Old Male with Patellar Dislocation, Fracture, and Osteochondral Lesion**

Ivan Wong\*

\*MD, MAcM, Dip. Sport Med., Division of Orthopaedic Surgery, Department of Surgery, Faculty of Medicine, Dalhousie University, Halifax, NS, Canada. *Address for correspondence:* 2106-5955 Veterans Memorial Lane, Halifax, NS, B3H 2E1, Canada. *Email:* research@drivanwong.com

### **Abstract**

A Levitation tri-compartment unloader (TCU) knee brace was prescribed as part of a postoperative rehabilitation plan for an active 18-year-old male who had dislocated and fractured his right patella. The Levitation brace was prescribed 10 weeks following a bone graft procedure. Between his 6-week and 6-month follow-up, the patient showed substantial improvements in several clinical measures, including improvements in IKDC and ED-50 scores, reductions in pain intensity and frequency, and increases in the intensity of tolerable activities and expectations surrounding an ability to return to previous recreations. These outcomes indicate that the Levitation knee brace can play a clinically meaningful role in postoperative rehabilitation.

### **Patient Introduction and Diagnosis**

Mr. BW is an active 18-year-old male who reported to the emergency department with a right patellar dislocation, fracture, and osteochondritis dissecans lesion in the lateral femoral condyle caused by a twisting movement of the upper body when his foot was planted.

### **Treatment Goals**

The goals for this patient are to strengthen and restore knee function while mitigating knee pain, locking, and stiffness so he can return to his normal life as a young, active student without worrying about future complications due to his knee injury.

### **Post-Surgical Rehabilitation Treatments**

Following the surgical procedure, Mr. BW was prescribed an above-knee immobilizer

which kept the leg in full extension and allowed for weight-bearing as tolerated.

When the cast and sutures were removed at 2 weeks postoperatively, the knee was not swollen, and the subject was able to achieve 30 degrees of knee flexion. Mr. BW did not report any pain in the right kneecap and was able to engage his quadriceps with minimal effort. Both the X-ray and IKDC functional scores were good. The rehabilitation plan for the following 8 weeks included a hinged knee brace and physiotherapy. Mr. BW used the brace for all activities, including sleeping.

The 10-week follow-up was conducted remotely given the COVID-19 pandemic. Mr. BW was able to flex his knee up to 90 degrees and had minor swelling. The next steps for rehabilitation included ongoing physiotherapy and switching from the hinged brace to the



Figure 1. 3D computed tomography of the right knee showing patellar dislocation and fracture.

Levitation TCU knee brace from Spring Loaded Technology.

The 5-month follow-up was again administered via phone call. At this time Mr. BW continues physical therapy treatments and has no concerns about future complications. The patient reports wearing the TCU brace 7 days a week for most of his daily activities and states that the brace has helped him regain strength. The brace also provides significant aid while going downstairs.

During the 11-month follow-up phone call, the patient has reduced his brace wear to predominantly exercise, which includes weightlifting and running, and will include his primary sport, baseball, once training resumes.

### Clinical Outcomes

The young patient had an excellent clinical outcome. The patient's IKDC scores increased from 36.8 to 73.6 between the 6-week and 6-month follow-up questionnaires. Within the first post-surgical month, Mr. BW experienced pain with an intensity of 4/10 approximately 10 times, compared to the 6-month follow-up questionnaire where he

indicated that his knee pain was reduced to an intensity of 3/10 and occurred only three times in the past month. The EQ-5D instrument was used to evaluate generic quality of life, and at 6 months the patient reported a full state of health with a perfect score compared to the 6-week follow-up where he reported having moderate problems with usual activities and slight problems with walking and pain.

At 6 weeks Mr. BW indicated that walking and housework were the highest intensity activities that he could perform without knee pain, compared to 6 months where he believed that he would be able to perform strenuous activities such as heavy physical work or skiing. At 6 weeks Mr. BW indicated he was 'not sure' about his expectations to return to his regular recreational activities, but at 6 months his expectations changed to 'definitely yes'. After 6 months, Mr. BW reported that he has been able to resume his regular activities and was very pleased with



Figure 2. Post-operative x-ray showing bone graft with screw fixation.

his progress due to the Levitation 2 TCU knee brace. Following 11 months of rehabilitation, Mr. BW indicated that he had the confidence in both his physical strength and performance of the TCU brace to return to baseball when

restrictions surrounding the pandemic were lifted.

### **Clinical Interpretation of TCU Brace Impact**

The Levitation 2 TCU knee brace is designed to enhance the strength and power of the quadriceps muscles by storing energy within a novel mechanical spring and releasing this energy to provide an assistive extension moment at the knee. This assistive force is easily adjustable, providing the opportunity to lower the power while muscles regain their strength. This feature of the Levitation 2 TCU knee brace, along with the benefits of alignment, stabilization, and pain alleviation from the reduction of joint compression<sup>1</sup>, makes it a great tool to use while returning to

weight-bearing activities during post-surgical rehabilitation while simultaneously mitigating the probability of future complications.

### **Conclusion**

Mr. BW underwent lateral femoral condyle osteochondral fragment fixation, open synovectomy, and arthroscopic loose body removal due to patellar dislocation. He was able to regain his confidence and return to normal activities with the aid of physical therapy and the Levitation TCU knee brace.

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<sup>1</sup>Budarick, A.R., MacKeil, B.E., Fitzgerald, S., Cowper-Smith, C.D., 2020. Design Evaluation of a Novel Multicompartment Unloader Knee Brace. *J. Biomech. Eng.* 142.