Case report

Non-surgical management of a tibiofemoral knee dislocation in a patient with sarcoidosis

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SUMMARY

This case presents a patient who sustained a knee dislocation, and who due to her diagnosis of sarcoidosis, other comorbidities, and prolonged use of corticosteroids, external fixation and physical therapy were implemented versus soft tissue reconstruction/repair. Research indicates worse functional outcomes with non-surgical treatment, and guidelines on optimising outcomes in this population are lacking. Integrated care of the patient—even when complex injuries and comorbid medical conditions are present—can lead to positive functional recovery, despite previous data. Evidence from related injuries can be successfully adapted in non-surgical management of these injuries, providing general treatment guidelines.

BACKGROUND**Introduction**

Knee dislocations are a controversial topic in orthopaedics.¹ Large-scale research is difficult in this population due to the complexity of the injury, so there is a lack of high-level evidence guiding treatment.^{2–4} Disruption of the anterior or posterior cruciate ligaments (ACL and PCL, respectively), or the medial or lateral collateral ligaments (MCL and LCL, respectively) occurs with knee dislocation, defined as disruption of three of these ligaments.^{2,4,5}

Prior to the mid-1980s to mid-1990s, most literature supported non-operative management for uncomplicated cases^{4,5}; however, now surgery is preferred.^{1,3–6} Surgery includes repair and/or reconstruction of the ligamentous structures. Persistent deficits are noted post-reconstruction, including: continued pain, joint instability and arthrofibrosis.⁷ However, surgical intervention receives better scores, or measures, on the International Knee Documentation Committee score,¹ Lysholm Knee Scoring Scale,^{4,6} and range of motion (ROM),⁶ in addition to higher rates of return to sport and work.⁵ Despite evidence showing improved outcomes in patients treated surgically, there are indications for non-operative management, most centred on comorbidities (eg, morbid obesity, patients with lower activity levels, etc), or associated trauma (eg, wound and soft tissue complications).⁸ Previous literature explores using the Compass Knee Hinge (Smith & Nephew, Memphis, Tennessee, USA) (hereafter referred to as a 'Knee Compass') after knee dislocation; however, only with reconstruction or repair of soft tissue.^{4,9} Marcacci *et al* used another hinged external fixator, with two patients

being able to return to employment.¹⁰ Rihn *et al* discuss rehabilitation after exclusive use of external fixation, by advising progressive mobility and avoidance of running before 6 months.¹¹ The authors are unaware of any literature mentioning use of the Knee Compass exclusively.

A previous clinical commentary⁸ and a case report¹² detailed progression postsurgically; however, the authors are unaware of rehabilitation guidelines for non-reconstructed/repared injuries. Existing literature for knee instability non-operative management was used to focus the plan of care (POC). One clinical practice guideline advocates for early mobilisation, open and closed kinetic chain (CKC) exercise, neuromuscular re-education, and supervised rehabilitation, among other principles.¹³

STATEMENT OF INFORMED CONSENT

The authors obtained exemption from review by the Institutional Review Board and informed consent for publication of protected health information.

CASE PRESENTATION**Case report**

The patient, a 30-year-old woman, was treated with placement of the Knee Compass (figure 1) 5 days after tripping on a curb. MRI revealed ACL, PCL, and LCL tears, with partial MCL disruption. The posterolateral corner, popliteal tendon and peroneal nerve were also injured. Her medical history included prolonged corticosteroid use for sarcoidosis, and hypertension (HTN). At the time of injury, the patient was unemployed, and restricted with shopping and bathing. She was independent with activities of daily living (ADLs) prior to injury, but did not drive. Physical therapy was initiated after 1 month.

The surgeon advised active-assisted ROM of 0–50° for 2 weeks, with a progression to 90–100° afterwards. Precautions allowed for foot-flat for ADLs, but non-weight bearing using a standard walker (SW) otherwise. An ankle-foot orthosis (AFO) to prevent foot drop was prescribed.

Initial evaluation data is recorded in table 1, including scores on the Lower Extremity Functional Scale and objective examination data. The first treatment session consisted of education on a home exercise programme (table 2). Progression to partial weight bearing (PWB) was accomplished, and after 1 month of treatment the patient progressed to quadriceps isotonics, and showed increased knee flexion. Neuromuscular electrical

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Figure 1 Frontal view of right knee during the first month of physical therapy.

Table 1 Objective measurements throughout the plan of care

	Initial eval	1 month	4 months	5 months	Discharge
LEFS Score	11/80	24/80	27/80	40/80	43/80
MMT					
Hip ABD	–	4/5	4/5	4/5	5/5
Hip FLEX	4/5	4/5	4/5	4+/5	5/5
Knee EXT	3-/5	3-/5	3-/5	3-/5	3-/5
Knee FLEX	3+/5	3+/5	3+/5	4+/5	5/5
Ankle DF	1/5	2/5	2+/5	5/5	5/5
Ankle PF*	3+/5	3+/5	3+/5	5/5	5/5
Ankle EV	2/5	2/5	2+/5	5/5	5/5
Ankle INV	3+/5	3+/5	3+/5	5/5	5/5
ROM†					
Knee EXT	2°/–	2°/–	2°/–	2°/–	4°/–
Knee FLEX	32°/40°	32°/47°	85°/96°	112°/120°	120°/120°
Ankle DF	–40°/–8°	–40°/–8°	–40°/–8°	6°/7°	7°/10°
Ankle PF	50°/–	50°/–	50°/–	50°/–	50°/–
Ankle EV	4°/20°	4°/20°	4°/20°	15°/25°	15°/25°
Ankle INV	30°/36°	30°/36°	30°/36°	35°/45°	40°/45°

*Assessed manually versus in closed kinetic chain.

†Assessed via goniometry.

ABD, abduction; DF, dorsiflexion; EV, eversion; Eval, evaluation; EXT, extension; FLEX, flexion; INV, inversion; LEFS, lower extremity functional scale; MMT, manual muscle testing; PF, plantarflexion; ROM, range of motion.

stimulation (NMES) for ankle dorsiflexion was initiated. The first re-evaluation was performed 1 month after POC initiation, with results in [table 1](#).

The Knee Compass was removed in the third month with a manipulation under anaesthesia—90° of knee flexion was obtained, with placement of a hinged knee brace (HKB). Progression from 25% PWB to weight bearing as tolerated was accomplished. Due to quadriceps weakness, the HKB was left locked in extension for weight bearing in this phase.

Isotonic exercises were increased during the fourth month ([table 2](#)). NMES was used, and is recommended for quadriceps strengthening post-ACL reconstruction.¹³ At 4 months, the patient was full weight bearing using a SW and wearing locked HKB and AFO. Improvements in objective measurements are noted in [table 1](#).

Stretching was initiated, with progression of ROM and CKC strengthening ([table 2](#)). Additionally, the HKB was shortened and unlocked with ambulation, and a quad cane replaced the SW. Shortly thereafter, the patient was able to progress toward meeting her short-term goal of ambulating ¼ mile without an assistive device (AD) or HKB.

Another re-evaluation revealed improvements at 5 months ([table 1](#)). The patient tolerated more advanced static and dynamic joint stabilisation activities, recommended for patients with instability.¹³ This included single-leg perturbations on a roller board. The uninvolved lower extremity was placed on a four-inch high block; the involved was placed about one step anterior in tandem stance on a roller board. The therapist provided perturbations in the sagittal and frontal planes, with progression to transverse plane. This set-up was similar to one used by Fitzgerald *et al*¹⁴; however, for this case the progression and verbal cueing were for balance, and one set-up was used. Stair management started and CKC strengthening progressed ([table 2](#)).

The patient began having issues with her HTN, contraindicating exercise, but maintained her gains ([table 2](#)). The patient started school, became independent with driving and ADLs, and was seeking employment. The patient could ambulate without an AD or HKB, and ascend and descend stairs with only one hand on the railing. See [table 1](#) for further details on her final measurements.

OUTCOME AND FOLLOW-UP

By discharge, evidence of joint stability was observed via negative findings for Anterior Drawer, Lachman, Valgus and Varus Stress at 0 and 30°, and Varus Stress. As a result of the outcomes achieved, there were no plans to return to the operating room for additional intervention. No symptoms about her knee were noted after more than a year when she presented to orthopaedics for other needs.

DISCUSSION

Although data shows unsuccessful outcomes from non-surgical management, there are times when this management method is required and/or preferable. In their discussion of non-operative versus operative management, Howells *et al*² emphasised the consideration of comorbidities and associated injuries. Richter *et al*¹⁵ discovered improved outcomes with surgery, but state that rehabilitation is a significant factor in all patients' recovery. It is important to note the patient was not returning to any athletic, high-impact activities. Skendzel *et al*⁸ pointed out that non-operative management was appropriate for patients without these high demands. The POC outlined in this case deviates somewhat from the norms described by Henrichs,¹⁶ mostly due

Table 2 Interventions and functional advancements by month of treatment

Month	Exercises	Ambulation	ADLs
0–1	<ul style="list-style-type: none"> ▶ Heel slides* ▶ Towel calf stretch* ▶ Patellofemoral joint mobilisation ▶ Low-load, long-duration flexion stretch* ▶ Short-arc knee extension ▶ SLRs ▶ Side-lying hip abduction 	<ul style="list-style-type: none"> ▶ Gait training: mod I with SW ▶ Progression to partial weight-bearing 	<ul style="list-style-type: none"> ▶ Education on HEP and portal site hygiene
1–5	<ul style="list-style-type: none"> ▶ Prone hamstring curls ▶ Long-arc knee extension ▶ NMES assisted SLRs ▶ NMES assisted DF ▶ Half-moon on recumbent bike ▶ Calf stretch with incline ▶ Mini-squats ▶ Tibiofemoral joint mobilisations ▶ Heel raises ▶ Forward lunges ▶ Off-loaded squats <ul style="list-style-type: none"> – bilateral – single leg affected 	<ul style="list-style-type: none"> ▶ Progression to full weight bearing with SW ▶ Gradual increase in ambulation distance ▶ SW replaced with quad cane ▶ Quad Cane discontinued ▶ HKB unlocked ▶ HKB discontinued ▶ Step-ups on stairs 	<ul style="list-style-type: none"> ▶ Education on shower safety ▶ HEP progression
5-D/C	<ul style="list-style-type: none"> ▶ Single-leg perturbations on roller board: <ul style="list-style-type: none"> – Transverse plane – Frontal plane – Sagittal plane ▶ Bridge with hip abduction and resistance band 	<ul style="list-style-type: none"> ▶ Stair management <ul style="list-style-type: none"> – 4 inches – 6 inches 	<ul style="list-style-type: none"> ▶ Patient starts school ▶ Transportation service ends ▶ Pt begins driving ▶ Pt graduates and seeks work

*Exercises for initial home programme given at initial evaluation.

DF, dorsiflexion; HKB, hinged knee brace; NMES, neuromuscular electrical stimulation; SLR, straight leg raise; SW, standard walker.

to the inclusion of a Knee Compass, which allowed for earlier progression of ROM without the precautions against allowing the patient's joint out of an arc of 45–90°, and the inclusion of manual therapy and flexibility exercises. This allowed the therapist in this case to be much more aggressive in ROM interventions. Additionally, the patient in this case primarily progressed with functional exercises, like lunges and squats, to improve lower extremity strength, versus machine resistance, with some exceptions. Finally, although the Henrichs recommendations were heavily joint specific to the knee, they did agree with the plan presented in this case by elaborating on functional activities to include, like recumbent bike and CKC proprioceptive training.

Fitzpatrick *et al*¹⁷ showed postoperative use of hinged external fixation led to decreased failure rates and increased joint stability when applied postreconstruction. In addition, Stannard *et al*⁹ also observed postreconstruction use of the Knee Compass allows movement in the sagittal plane, allowing aggressive ROM progression while protecting healing tissues in a stable environment.⁹ Although our patient did not undergo reconstruction, the stability provided by the Knee Compass increased the final joint stability and allowed earlier mobility.

Another factor that cannot be ignored is the motivation level of the patient in this case. As mentioned previously, on discharge the patient was not only able to pursue job training and employment, but also driving, all three of which she was not pursuing prior to her injury. These developments are evidence of an improvement in the patient's motivation throughout the treatment process. Additionally, the patient's compliance throughout the POC, with home exercise, attendance, and effort during difficult sessions, cannot be ignored, and should be considered

at least equal in magnitude to the treatment plan in meeting the achieved outcomes.

In conclusion, the authors' believe despite data showing lower patient satisfaction, functional outcomes, and community participation for a given population, there is no replacement for a patient who is motivated and is paired with a POC specific to their needs. A team approach with close communication is advocated for appropriate management of these injuries.¹⁸ Future research should focus on interprofessional collaboration for managing patients with complex injuries.

Learning points

- ▶ Patients with knee dislocations are frequently encountered by physical therapists only after surgical reconstruction, with non-surgical management being less common.
- ▶ There is currently no evidence guiding physical therapists on how to manage these patients comprehensively without reconstruction.
- ▶ Evidence from related literature can guide the plan of care and decision making.
- ▶ Communication and collaboration between the physical therapist and physician is crucial.

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