



# Dynamic Bracing for Contracture Management

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## INTRODUCTION

Contracture management has been one of the more difficult challenges we face as orthotists. Joint stiffness or contractures may be caused by immobilization following surgery, disease or trauma. Joint contracture is associated with reduced range of motion (ROM) due to structural changes in non-bony tissues, including muscles, tendons, ligaments and skin. Ensuring optimum results for our patients in order to prevent surgery or regain the biomechanics for ambulation and/or activities of daily living are what we strive for and expected of us. How can we achieve such results? What are the key factors necessary in order to provide the best possible outcome? This case study will focus on using low-load prolonged stretch (LLPS) protocol with the use of a dynamic knee extension orthosis. (DKEO)

## PATIENT PROFILE

Patient is a 28 year old male involved in MVA in 2014 resulting in incomplete spinal cord injury at T12. Standing at 5'6" and weighing 158#, patient presents with bilateral lower extremity weakness and paralysis. MMT for lower limbs is 0 with hips at 3-. Patient is unable to stand or walk independently. He is mobile with the use of wheelchair. Patient received limited rehab services post MVA, spending most of his time in wheelchair. As a result, patient now has -25 degree soft tissue knee flexion contracture of right knee. (See Figure 1)



Figure 1, -25 degree knee flexion contracture



Figure 2. Dynamic Knee Extension Orthosis

## GOALS

Patient had started to undergo regular outpatient physical therapy and was highly motivated to walk again. Physical therapy goals were to eliminate knee flexion contracture in order to begin working on independent standing and possibly ambulation. Orthotic goal was to provide a dynamic stretch over time to get the most productive and safe stretch possible.

## METHODS

An orthosis design for treating extension contractures that gradually increases range of motion. The thigh and calf cuffs were custom fabricated using 3/16" polypropylene and joined with a lateral MultiMotion size regular corrective joint that permits gradual torque/force adjustment from 0 to 90 inch pounds, a medial MultiMotion size regular free motion joint to provide the desired torsional stiffness to the orthosis, and an anterior knee cap to create three point system for application of force. (See figure 2). The custom knee orthosis was used during night-time hours to provide LLPS in order to gain optimum results while measuring ROM weekly to ensure ROM increased over eight week period.

## PROCEDURE

Starting tension set at 4 (See figure 3). The typical starting range is between 2 and 4. When using regular size MultiMotion corrective joint, value should be set to sub-maximum spring tension (SMST) the patient can tolerate for a time period of 7-8 hours a day. After initial acclimation period patient wore KEO for 10-12 hours a night. Patient was followed up on a weekly basis, testing ROM of the knee. As long as there was an increase of ROM the tension remained set to 4. When a plateau was reached, tension was increased to new SMST. (See figure 4 – Weeks 4 & 5)



Figure 3. Tension adjustment started at 4

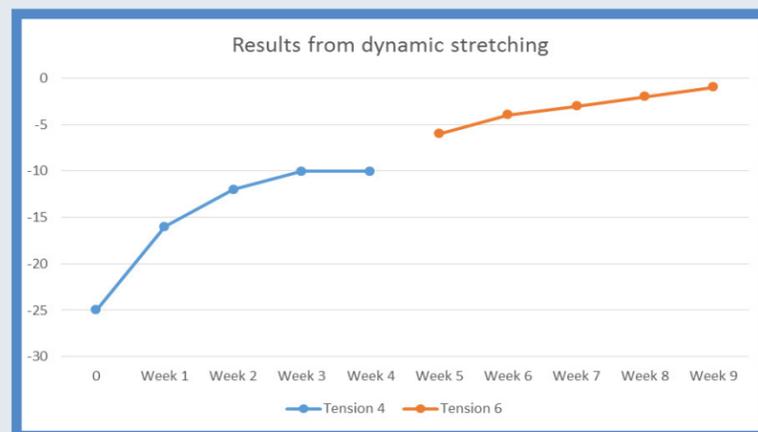


Figure 4. Knee Extension ROM

## RESULTS

ROM was recorded on a weekly basis during the patient's therapy session by the physical therapist. It was observed that best results came the weeks after a tension increase. The greatest increase occurred during week 1 (See figure 4). Patient is now able to fully extend knee and can begin working on standing during therapy.

## DISCUSSION

After conducting this case study it is evident that dynamic splinting for contracture management is a viable, noninvasive and non-stressful treatment. However, we face several challenges in order to achieve desired results such as compliance, proper follow-up and knowing when to provide such orthosis. The intention of the study is to instill confidence and knowledge to achieve maximum outcome using a DKEO

## REFERENCES

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## ACKNOWLEDGEMENTS

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