

THE EFFECT OF FEMORAL STRAPPING ON PAIN RESPONSE, HIP ROTATION AND GLUTEUS MAXIMUS ACTIVATION IN PERSONS WITH PATELLOFEMORAL PAIN

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INTRODUCTION

Recently, it has been recognized that the patellofemoral joint can be influenced by the segmental interactions of the lower extremity.¹ Using dynamic MRI methods under weightbearing conditions, Powers et al.² demonstrated that the primary contributor to lateral patellar tilt and displacement in a group of individuals with patellar instability was femoral motion (internal rotation) and not patellar motion. This finding calls into question the long-held assumption that subluxation is the result of the patella moving on the femur. Given the recent focus on the control of hip motion as a possible treatment option for patellofemoral pain (PFP), the S.E.R.F. Strap™ (Don Joy Orthopaedics Inc.) was developed to assist in this effort. The S.E.R.F. Strap™ consists of thin, elastic material that is secured to the proximal tibia, wraps around the distal thigh, and is anchored around the pelvis (Fig. 1). The line of action of the S.E.R.F. Strap™ is designed to pull the thigh into external rotation. It is thought that femoral strapping may augment muscular control at the hip as well as improve lower extremity kinematics during dynamic activities. The purpose of this pilot study was to test this premise by evaluating the effects of the S.E.R.F. Strap™ on pain response, hip internal rotation, and hip external rotator muscle activation during dynamic activities in persons with PFP.



Fig. 1: S.E.R.F. Strap™ application

METHODS

Five subjects with a diagnosis of PFP took participated (4 females, 1 male; mean age 32 yrs). Pain levels (VAS pain scale), 3D kinematics (8-camera Vicon motion analysis system; 60 Hz), and EMG activity of the gluteus maximus (surface electrodes, 1200 Hz) were obtained as subjects performed a step down maneuver, a drop jump task, and ran at 3.5 m/sec. All testing was performed with and without the S.E.R.F. Strap™. Data from three trials were averaged for analysis. Dependent variables included average pain scores during the step down task, peak hip internal rotation, and average gluteus maximus EMG during the stance phase of each activity.

RESULTS

On average subjects reported a 50% reduction in pain following the application of the S.E.R.F. Strap™ (Fig. 1). Femoral strapping was found to significantly reduce hip internal rotation during the step down maneuver (9.1° IR vs. 2.5° ER), running (8.7° IR vs. 1.0° ER), and the drop jump task (3.8° IR vs. 3.9° ER). When averaged across all conditions tested, gluteus maximus EMG activity was found to increase 178% following the application of the femoral strap (Fig. 3).

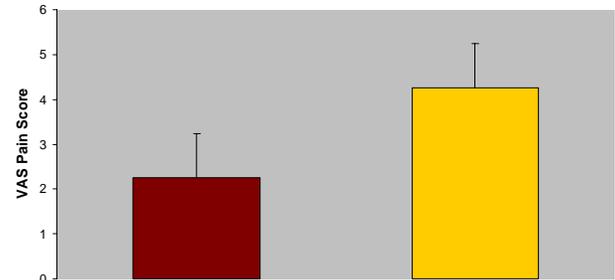


Fig. 2: Average pain scores following femoral strapping

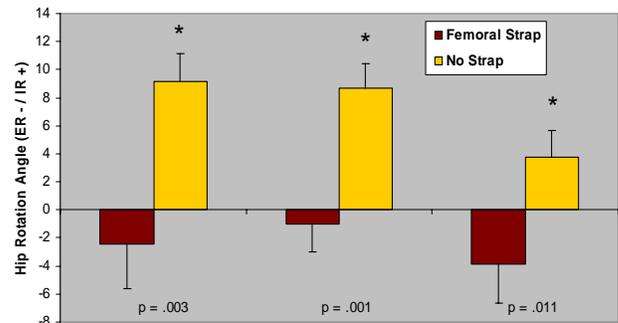


Fig. 3: Changes in hip rotation following femoral strapping

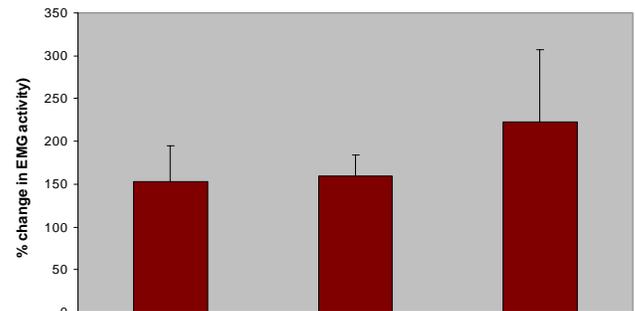


Fig. 3: Changes in gluteus maximus EMG following femoral strapping

SUMMARY

Following the application of femoral strap, all subjects reported a reduction in symptoms. This was accompanied by significant reductions of hip internal rotation and improved external rotator activation for all activities tested. These data support the premise that patellofemoral joint dysfunction may have a proximal origin (i.e. hip) and suggest that the S.E.R.F. Strap™ may be a viable option for the treatment of PFP.

REFERENCES

- 1) Powers, *J Ortho Sports Phys Ther*, 33:639-646, 2003
- 2) Powers et al., *J Ortho Sports Phys Ther*, 33:677-685, 2003