Grant Information Summary:

Gait Perturbations Response in Pre & Post Anterior Cruciate Ligament Surgical Subjects & Healthy Individuals

Practical Significance:

This study shows that anterior cruciate ligament injured subjects exhibited greater hamstring activity than non-injured subjects when reacting to interruptions in gait.

Background

Few studies have been conducted that quantify reactive gait alterations due to unexpected forward perturbations. As well, few studies have been performed on anterior cruciate ligament (ACL) subjects prior to and following reconstructive surgery to assess normal gait patterns and no studies have been conducted regarding how ACL injured patients respond to unexpected gait perturbations. Information from this study will help to better understand how normal gait patterns may change as a result of ACL injury and how ACL injured individuals react to gait perturbations prior to, and 3 months following, surgery.

Objective

To determine the effect of gait perturbations on knee muscle electromyographic (EMG) activity in ACL deficient subjects prior to, and 3 months following, surgical repair.

Design & Settings

An unexpected forward perturbation (FP) was applied at heel strike by a platform on which subjects walked.

Subjects

10 ACL-injured and 10 age and sex-matched controls (CON) subjects participated. ACL subjects

were tested prior to (PRE) and 3-months following reconstructive surgery (POST).

Measurements

Knee muscle EMG information was collected during non-perturbed (NP) and FP conditions.

Results

During NP, PRE and POST demonstrated significantly greater hamstring EMG activity during early stance, compared to CON (Fig 1). PRE also exhibited significantly greater gastrocnemius EMG activity during midstance of NP, compared to CON (Fig 2). During FP, PRE and POST exhibited significantly greater hamstring EMG activity late in stance (Fig 3) and significantly less quadriceps EMG activity during midstance (Fig4), compared to CON.

Conclusions

During non-perturbed gait, ACLD subjects tested prior to reconstruction demonstrated greater hamstring and gastrocnemius EMG activity than did the control subjects. In addition, when these same subjects were tested 3 months after surgical reconstruction they continued to exhibit greater hamstring EMG activity as compared to the controls during non-perturbed gait. We believe this was a functional change that provided greater knee stability. In response to the forward perturbation, the ACLD subjects demonstrated greater hamstring EMG activity but a reduced vastus lateralis reactive EMG response prior to and following reconstructive surgery as compared to the control subjects. Again, we hypothesized that these muscular responses resulted in greater knee stability in response to the forward perturbation.

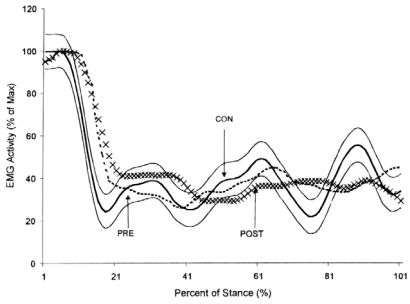


Figure 1. Hamstring EMG for PRE (dashed thick line), POST (dashed hatches), and CON (solid thick and thin lines = mean± 1SD) subjects during NP gait. Values are normalized to maximum within-trial EMG amplitude.

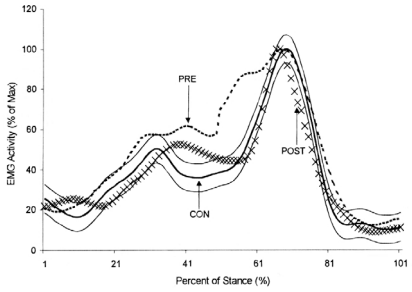


Figure 2. Gastrocnemius EMG for PRE (dashed thick line), POST (dashed hatches), and CON (solid thick and thin lines = mean± 1SD) subjects NP gait. Values are normalized to maximum within-trial EMG amplitude.

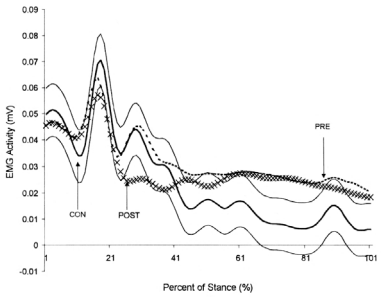


Figure 3. Representative example of hamstring EMG for PRE (dashed thick line), POST (dashed hatches), and CON (solid thick and thin lines = mean± 1SD) subjects during FP gait.

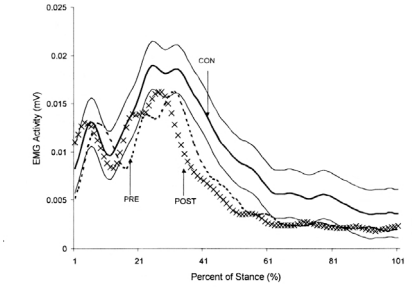
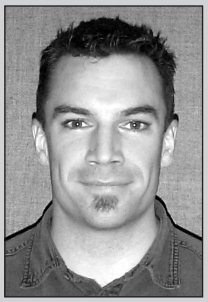


Figure 4. Representative example of vastus lateralis EMG for PRE (dashed thick line), POST (dashed hatches), and CON (solid thick and thin lines = mean± 1SD) subjects during FP gait.

Principal Investigator:



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Publication & Presentation List

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