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POST ARTHROSCOPIC PARTIAL MENISCECTOMY ADDUCTION MOMENTS IN GAIT PREDICT KNEE RADIOGRAPHIC CHANGES

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INTRODUCTION:

Severity of radiological osteoarthritis (OA) of the knee is positively correlated with increased external peak knee adduction moments during gait and peak knee extension angle at heelstrike [1]. Increased adduction moments during the stance phase of gait have also been recently identified in arthroscopic partial meniscectomy (APM) patients when compared to controls and taking into account body weight [2], and APM patients also have an increased rate of development of radiological OA [3]. Adduction moments during gait have been predictive of radiographic OA progression over 6 years [4]. Additionally, heel strike transient forces (HSTF) have also been implicated in the development of OA, but never tested in human populations. Therefore, this study aimed to investigate if post-APM surgery adduction moments and HSTF during gait were predictive of the development of radiological OA in these APM patients.

METHODS:

Eighteen APM patients underwent three-dimensional gait analysis with a 50Hz Vicon motion analysis system, within 4-12 weeks of surgery. 3D joint moments were calculated according to established procedures [5]. Bilateral semi-flexed (30 deg) standing posterior-anterior view radiographs were taken within 1 week of gait analysis, and again at 48 months post-surgery. Radiographs were graded for tibio-femoral joint space width (JSW), osteophyte formation, and tibial spiking [6]. Fourteen controls, matched for age and body mass index, underwent the same testing protocol.

Peak knee adduction moment and HSTF were identified during the stance phase of gait. The peak knee adduction moment was normalised to body weight. The relationships between kinetics at baseline and the change in radiological scores at 4-year follow-up were quantified using Spearman rank correlation (1-tailed). Significance was set at $p < 0.05$. Knee adduction was reported as negative and change in radiographic values was calculated so that positive values

indicate a degeneration. Therefore a negative correlation will indicate an association between higher peak moments and greater degeneration.

RESULTS AND DISCUSSION:

The post-surgery weight-normalised peak knee adduction moment during gait was associated with an increase in medial tibial spiking in APM patients 48 months post-surgery (Table 1). An increased vertical ground reaction force at heel-strike (HST force) was also associated with a worsening of the total x-ray score in APM patients however the inverse was true for controls (Table 1). This different affect from HST may be due to the APM patients having an injured knee, where controls knees were uninjured at baseline.

CONCLUSIONS:

This study is the first to indicate that peak knee adduction moments and HSTF during gait are predictive of the development of radiological OA in APM patients. Given the relationships that have already been shown to exist between OA populations and increased adduction moments during gait, and the increased propensity of APM patients to develop knee OA, these results suggest a possible mechanical basis for OA development. This association indicates that modification of peak adduction moments and HSTF may alleviate further development of knee OA.

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Table 1: Table showing Spearman correlation between baseline gait kinetics and changes in radiological features over 4 years.

		Normalised peak adduction moment (r)	HST force (r)
APM patients	Medial TF JSW		
	Medial tibial spiking	-.416*	
	Total X-ray score		-.647*
Controls	Medial TF JSW		
	Medial tibial spiking		
	Total X-ray score		.708**

*. Correlation is significant at the 0.05 level (1-tailed).

**. Correlation is significant at the 0.01 level (1-tailed).