SEVERITY OF KNEE OSTEOARTHRITIS AND ITS EFFECT ON GAIT MECHANICS IN WALKING

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INTRODUCTION

Osteoarthritis (OA) of the knee, affecting 10% of adults ages 55 and over (Balunias et al, 2002), is characterized by pain and lack of mobility. The etiology of knee OA is not entirely clear, however, previous research has determined a number of risk factors for the disease. These include obesity, gender, age, repeated trauma to joint tissues, and lower extremity injuries (Lohmander et al, 2004). Consequently, there is a great need to better understand how these factors may influence the severity or progression of the disease. Most often, a combination of these risk factors is present in persons with OA, which leads researchers to the question— which risk factor is most responsible for altered gait mechanics? This study addressed that question through the examination of the effects of the severity of OA on gait mechanics in a large sample of obese patients with knee osteoarthritis of varying radiographic degree.

METHODS

The study population consisted of 137 subjects (35 men, 102 women) with radiographic OA in at least one limb. All subjects were obese (BMI ranged from 25-42; Mean= 34.12±4.36); morbidly obese were excluded from the study. Three-dimensional kinematic data was collected at 60Hz using a motion analysis system (Motion Analysis Inc, Santa Rosa, CA). Subjects performed three practice trials and five walking trials along a 30m walkway at three self-selected speeds (normal, fast and intermediate). Ground reaction force data was collected using two AMTI force plates. Data were processed using OrthoTrak 6.29 (Motion Analysis Inc, Santa Rosa CA). OA severity levels were established through the Kellgren-Lawrence radiographic grading system: mild (K/L =1), moderate (K/L = 2 or 3), and severe (K/L = 4); limbs with K/L<1 were excluded from analyses. Correlation between level of OA and the gait variables was evaluated using Pearson’s correlation coefficient (r). A 1x3 ANOVA was used to compare means for knee range of motion (KROM), as well as means for peak vertical force (PVF), for the different levels of OA at each speed (α=0.05). Post-hoc testing (LSD) was performed when necessary.

RESULTS AND DISCUSSION

There was an inverse correlation between K/L grade and KROM at normal (r= -.27, p<.05) and fast speeds (r= -.32, p=.01) for the left limb. An inverse correlation also existed between K/L grade and KROM in the right limb at the normal speed. Differences in KROM and PVF existed at all three speeds. There was a significant difference in KROM between subjects with mild and severe OA in their left limb at both normal and fast speeds (Figure 1).
None of the spatiotemporal variables showed a strong correlation with K-L grade. However a significant correlation between K-L grade and support time was displayed at fast speeds ($r=.282, p=.05$). Small correlations between K-L grade and PVF at fast speeds also existed. Average knee ROM was consistent with previous reported values in persons with OA; it was also smaller than that of persons without OA (Baliunas et al, 2002; Messier et al, 2005).

**SUMMARY/CONCLUSIONS**

We hypothesized that certain biomechanical gait parameters would vary with severity of OA. Our preliminary study indicates that variation in gait could not be fully explained by K/L grade; although, when K/L grade was grouped by severity, significant differences did exist. Still, the significant associations between severity of OA and biomechanical gait parameters only account for about 10% of the variance. Therefore, other critical factors, such as level of pain or psychosocial variables, found to be important in understanding pain and disability in persons with OA may be more strongly correlated with the altered gait mechanics associated with the disease. Further research should be done in order to gain a better understanding of what factors contribute to the majority of variation in gait associated with OA.

**REFERENCES**


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