SPINAL MOTION DURING WALKING IN PERSONS WITH TRANSFEMORAL AMPUTATION WITH AND WITHOUT LOW BACK PAIN

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INTRODUCTION

Low back pain (LBP) is a prevalent condition among the general population [1]. Studies [2,3] have reported that persons with transfemoral amputation (TFA) are significantly more likely to suffer from LBP than persons with transtibial amputation.

Although it has been suggested that gait abnormalities may contribute to LBP, limited investigations have attempted to correlate LBP to kinematic variables, especially spinal motion. Typically, gait models disregard the spine entirely or regard it as a single rigid structure. Knowledge of spinal motion in TFA is limited, yet understanding spinal motion during walking could improve understanding of the factors contributing to LBP. Hence, the purpose of this study was to investigate whether there are differences in spine kinematics during walking in persons with unilateral TFA with and without LBP.

METHOD

Subjects: Persons with unilateral TFA were recruited to participate in this study, which was approved by the Northwestern University Institutional Review Board.

Inclusion/Exclusion Criteria: Participants were experienced prosthetic users who were able to walk without walking aids other than their prosthesis. Subjects were excluded if they had any comorbidities affecting gait or function of their contralateral limb.

Procedures: Subjects were tested once in the motion analysis laboratory. Reflective markers were taped to anatomical landmarks on lower limbs, pelvis and spine using a modified Helen Hayes model [4] and a regional spine model [5]. A minimum of five walking trials at a comfortable self-selected speed were recorded.

Data Analysis: Orthotrak software (Motion Analysis Corp., Santa Rosa, CA) was used to analyze the lower extremity kinematic data while spine kinematics were analyzed using Visual 3D (C-Motion, Germantown, MD). Student’s two tailed t-tests were used to compare data between groups with significance set at α = 0.05.

RESULTS

To date, data were collected from 10 persons with TFA (6 males/4 females), age 48±14 years, height 172±8 cm, and mass 82±20 kg. Four of the 10 subjects reported experiencing LBP in the 30 days prior to the study. Walking speeds were 0.99±0.31 m/s for persons reporting no back pain (NBP) and 0.86±0.28 m/s for persons reporting back pain (BP) (p=0.33). There was no difference between groups in prosthetic limb stance knee kinematics (p=0.43), hip abduction (p=0.15) and flexion (p=0.17) range of motion (ROM). Coronal plane ROM for the lumbar spine and pelvis was significantly larger in the group with LBP than the group without LBP (Table 1).

Table 1. ROM for the two groups (NBP-no back pain, BP-back pain). *(n=3) data for 1 subject was excluded due to technical issues. *Significant difference. Transverse plane.

DISCUSSION

We found that coronal plane lumbar and pelvic motion were greater in TFAs with LBP than those without. A similar study of TFAs with back pain reported an increase only in transverse plane spine ROM [6]. Data collection is ongoing with a target sample size of 22.

CONCLUSION

Preliminary results suggest that there exist some spine kinematic differences during walking in TFAs with and without LBP.

REFERENCES


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