

COMPARISON OF SURGICAL RECOMMENDATIONS FOR CHILDREN WITH CEREBRAL PALSY AND KNOWN OUTCOMES WITH AND WITHOUT COMPREHENSIVE GAIT ANALYSIS

^{1,2}Frank Chang, ¹Adam Seidl, and ^{1,2}James J. Carollo

¹Center for Gait and Movement Analysis (CGMA), The Children's Hospital, Denver, CO

²University of Colorado Health Sciences Center, Department of Orthopaedics, Denver, CO
contact: chang.frank@tchden.org, 1056 E. 19th Ave. B476, Denver, CO 80218

Introduction

Comprehensive gait analysis is frequently used in the pre-operative planning of treatment in children with cerebral palsy. Despite its increasing popularity, a debate exists concerning the efficacy of gait analysis in surgical decision making. Proponents argue that gait analysis objectively and accurately assesses the gait impairments that are the result of soft tissue and bony deformities in children with cerebral palsy [1]. Critics and some third party payors contend that gait analysis is little more than a costly research apparatus of minimal clinical value [1]. Many experienced clinicians assert that gait analysis is unnecessary in their surgical decision making for children with cerebral palsy. Our previous study demonstrated that children with cerebral palsy who follow through with surgical recommendations made from gait analysis experience a significantly greater percentage of positive outcomes than matched children who ignore these surgical recommendations [2]. Furthermore, Lee et al. demonstrated that most children who do not improve after surgery underwent operations that differed from those recommended by gait analysis [3]. This study uses a patient population already shown to have a high percentage of positive outcomes in an attempt to demonstrate that the recommendations from comprehensive gait analysis differ from recommendations from clinicians using data available at a typical clinical evaluation.

Statement of Clinical Significance

This retrospective study indicates that surgical recommendations made from gait analysis are significantly different, in number and location of intervention, than surgical recommendations made by clinicians performing a typical clinical evaluation. More importantly, this study demonstrates that patients known to experience a high percentage of positive outcomes following gait analysis recommendations would not have received the same recommendations from clinical evaluation without comprehensive gait analysis.

Methods

Ten children with cerebral palsy were selected due to their involvement in an ongoing study with preliminary results previously reported [2]. The percent positive outcome was determined using the strategy described in Chang et al [2]. Surgical recommendations from comprehensive gait analysis were made by a multidisciplinary gait lab team (GLT) consisting of a pediatric orthopaedic surgeon, pediatric physiatrists, physical therapists, kinesiologists, and a biomedical engineer. Gait analysis recommendations were based on laboratory findings and a systematic data interpretation strategy previously described [4]. Clinical recommendations were individually made by 2 pediatric physiatrists and 4 pediatric orthopaedic surgeons (2 with more than 30 years of surgical experience), all of whom actively treat children with cerebral palsy. The 6 clinicians made surgical recommendations using information typically available during a clinical evaluation: patient history, physical examination data, and split-screen video footage (substituted for the usual observation of the child ambulating in clinic). Clinicians indicated which surgeries he or she would recommend

for each patient. Clinicians' recommendations were compared, by number and location of intervention, to the recommendations of the GLT. The average number of surgeries recommended by the clinicians was compared to the average number of surgeries recommended by the GLT. The percent agreement between the clinicians' surgical recommendations and the GLT's surgical recommendations was calculated. In addition, each surgical recommendation was categorized as the lower extremity joint or segment that the procedure targeted. The percent agreement between the targeted surgery location recommended by the clinicians and the GLT was calculated with kappa statistics.

Results

The average number of surgeries recommended from gait analysis (5.8) was determined to be significantly greater than the average number of surgeries recommended from clinical data alone (2.60) at the level $p < 0.001$. The 2 physiatrists recommended an average of 2.70 surgeries; the 4 orthopaedic surgeons recommended an average of 2.55 surgeries. Percent agreement between the 6 clinicians' surgical recommendations and the GLT's surgical recommendations was 25.37%. Specifically, 31.34% of the physiatrists' recommendations agreed with the GLT's recommendations and 22.46% of the orthopaedic surgeons' recommendations agreed with the GLT's recommendations. For the location of the recommended surgeries, the percent agreement between the group of 6 clinicians and the GLT was 41.98% with an average Kappa statistic of 0.29 (range: 0.09-0.50), indicating poor agreement.

Discussion

This study indicates that gait analysis results in the recommendation of significantly more surgeries than a typical clinical evaluation. Many believe that single-event multilevel surgery leads to improved long-term outcomes and decreased overall expenses. Several studies have demonstrated that gait analysis alters surgical decision-making in children with cerebral palsy. Kay et al. reported that surgical treatment plan was altered after gait analysis in 89% of patients [4]. Our study shows that 76% of gait analysis recommendations are different than recommendations made using clinical data and that comprehensive gait analysis alters the location of the surgery, as recommended from a clinical evaluation, 58% of the time. This study is unique because the patients included have had their outcomes analyzed. These patients followed the gait analysis recommendations and experienced a significantly higher percentage of positive outcomes than matched patients who chose not to observe gait analysis recommendations [2]. It was our goal to prove that the recommendations resulting in positive outcomes could not have been made without comprehensive gait analysis. We found a low percent agreement between the recommendations from gait analysis and the recommendations made without gait analysis. This indicates that gait analysis alters surgical recommendations for children with cerebral palsy. Also, with its link to a previous study, it demonstrates that the altered surgical recommendations, when observed, result in a high percentage of positive outcomes.

References

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