Walking abilities of young adults with cerebral palsy: Changes after multilevel surgery and adolescence

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ARTICLE INFO

Article history:
Received 20 May 2009
Received in revised form 27 February 2010
Accepted 7 March 2010

Keywords:
Cerebral palsy
Gait
Natural history
Surgical outcomes

ABSTRACT

Although there is some evidence to support the efficacy of single event multilevel surgery (SEMLS) in the short term for improving walking abilities in children with cerebral palsy (CP), long-term effects are not known. It is hypothesized: (1) SEMLS improves walking abilities; (2) in young adulthood abilities deteriorate beyond pre-operative status; (3) walking abilities deteriorate from adolescence to young adulthood and are associated with weight status increase. Twenty-three young adults (mean age 25.5 years, range 20-36) with spastic CP Gross Motor Functional Classification Scale Level II (n = 11) or III (n = 12) returned for follow up three dimensional gait analysis (3DGA). Gillette Gait Index (GGI) was used as a general indicator of walking abilities. Eleven subjects had 3DGA prior to multilevel orthopedic surgery and 12 subjects had 3DGA after the age of 10 with no interventions in the interim. GGI(s) were graphed over time. Ten of 11 subjects (91%) who had multilevel surgery either improved (n = 6) or maintained pre-operative walking abilities (n = 4) based on GGI. Ten of 12 subjects (83%) who had 3DGA after the age of 10 but no interventions in the interim maintained (n = 8) or improved (n = 2) walking abilities. No associations were found between declines in walking abilities and increased weight status. After SEMLS, walking abilities in young adulthood were comparable to pre-operative status. A decline in walking abilities was not observed from adolescence to young adulthood.

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1. Introduction

Multilevel orthopedic surgery for children with cerebral palsy (CP) improves the appearance, speed, and efficiency of gait by simultaneously realigning the lower extremity pathomechanics of the hip, knee, and ankle [1-3]. There is some evidence to support the efficacy of these interventions in the short term (one year to under 3 years follow up) [4,5]. In the longer term (more than 3 years follow up) however, it can be difficult to predict who will benefit the most from surgical intervention and few studies have attempted to look beyond 3 years. Adolfsen et al. [6] and Gannotti et al. [7] identified children with crouch who have maintained surgical gains at the knee 4 years post-operatively. There is little evidence to support continued or maintained improvement of function into adulthood [8]. More information is needed about the impact of orthopedic interventions that occur in childhood and adolescence on quality of walking ability in young adulthood.

One difficulty in evaluating the impact of orthopedic surgery (or other interventions) is that there is little information available about the natural history of walking in children with cerebral palsy. There is evidence that many children decline in walking ability as they enter adolescence [9], and that improvements made after interventions may be masked by declines that occur even within the time span of a year [10].

The International Classification of Functioning, Disability, and Health (ICF) [11] models the relationships among health conditions, body structures and function, personal factors, environmental factors, activity, and participation. Walking abilities are affected by multiple factors [12], and should be evaluated within the larger context of a person's daily activities and participation in society, life experiences, and individual characteristics.

This report is part of a larger project which evaluates the relationship among walking abilities in young adulthood, activity, and participation in society. The purpose of this report is to use a series of case studies to test the following hypotheses:

(1) Walking abilities improve after single event multilevel surgery;
(2) However, in young adulthood walking abilities will deteriorate beyond pre-operative status; and
(3) Walking abilities decline from adolescence to young adulthood, and are associated with an increase in weight status.

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doi:10.1016/j.gaitpost.2010.03.002