WHICH CHILDREN WITH CEREBRAL PALSY WILL GO OFF THEIR FEET – AND WHY? A PRELIMINARY STUDY

PB Butler[1], G Cole[2], SE Jarvis[1], J James[3]
[1]The Movement Centre [2]Orthotic Research and Locomotor Assessment Unit
Robert Jones & Agnes Hunt Orthopaedic & District Hospital NHS Trust, Oswestry, Shropshire SY10 7AG, UK
[3]The Chartered Physiotherapy Clinic Ltd, Gwenfro Unit 10, Wrexham Technology Park, Wrexham LL13 7YP, UK

Introduction

The result of surgery to improve walking ability in children with cerebral palsy is increasingly reported[1, 2]. However, many of these studies have followed children for only two or three years and thus the longer term results have not been clarified. Surgery is expensive, both financially and in terms of the hopes and effort put in by the children, their families and their wider care team. This study was a preliminary retrospective comparison of children before and after surgery that was carried out to improve walking potential and where the long-term walking status (six years post surgery) was known. The purpose was to identify factors predictive of long-term walking status and, from these, to increase understanding about why children might go off their feet.

Methods

A convenience sample was selected of 21 children where the Hoffer classification[3] of walking status six years post surgery was known and ensuring that approximately equal numbers of community, household and non-walkers were represented. All children had cerebral palsy (15 male, 6 female, mean age 11.0 years) and had attended the Gait Laboratory in Oswestry. The classification of Hoffer status had been made independently by the child's local team. Data including previous surgery and passive range of joint motion was extracted from hospital / gait analysis records. A simple video scoring system was devised for stance phase foot/ankle problems (Very Severe through Normal), stance knee geometry (Very Flexed through Hyperextended) and stance knee ground reaction vector (grv) alignment where available (Very Flexing through Very Extending). Pre-operative video was then scored by an independent assessor. Wilcoxon Rank-Sum test / t-test was used as appropriate on the most promising indicators.

Results

The video scoring system was revised until three experienced physiotherapists reached agreement. Hoffer classification of current status identified 8 community walkers (C), 5 household (H) and 8 non-walkers (NW). Mean age at pre-operative assessment showed that NW were older (NW=11 years 5 months, H=10 years 10 months, C=10 years 7 months) and were also taller and heavier (mean weight NW=40.7kg, H=34.6kg, C=30.4kg, p=0.03 NW+H v C). There was no marked difference between groups in surgical procedure undertaken. Range of passive joint motion showed only that NW had slightly greater limitation of knee extension. Seven eventual community walkers did not use walking aids pre-operatively, with the eighth child not reliant on his aids in contrast to high rates of walking aids use / reliance of H and NW. Walking speed distinguished community walkers (C=0.84m/s, H=0.43m/s, NW=0.52m/s, p=0.001 NW+H v C) as did

Physiological Cost Index (extra hbpm) (C=0.64, H=1.74, NW=2.37, p=0.005 NW+H v C). H and NW had a greater severity of foot/ankle problems pre-operatively. Stance knee geometry revealed no difference between groups but grv alignment showed that only eventual community walkers attained a neutral knee moment at mid-stance.

Conclusion

It is recognised that this is a small study of highly selected children to give comparable numbers of C, H and NW. It was found that neonatal factors, precise diagnosis and type of surgery did not seem influential while pre-operative slow speed of walking (<0.56m/s), reliance on walking aids, weight (>40kg) and high energy consumption (>0.92 extra heart beats per metre (hbpm)) were indicative of a poorer long-term outcome. Preliminary or alternative management strategies may thus be more appropriate for children with this presentation. The difficulties associated with growth and maintenance of function have previously been recognised[4] but this study has revealed additional factors relating to control at the knee that may be influential. Further research would be helpful in clarifying these issues.

References

1. Saraph V, Zwick E-B, Zwick G, Steinwender C, Steinwender G, Linhart W (2002), Multilevel surgery in spastic diplegia: evaluation by physical examination and gait analysis in 25 children, J Pediatr Orthop, 22, 150-157
2. Scwartz MH, Viehweger E, Stout J, Novacheck TF, Gage JR (2004), Comprehensive Treatment of Ambulatory Children with Cerebral Palsy. An outcome assessment, J Pediatr Orthop, 24, 45-53
3. Hoffer M, Feiwell E, Perry R, Perry J, Bonnett C (1973), Functional ambulation of patients with myelomeningocele, Journal of Bone & Joint Surgery, 55A, 137-48
4. Bell, KJ, Ounpuu S, DeLuca PA, Romness MJ (2002), Natural progression of gait in children with cerebral palsy, J Pediatr Orthop, 22, 677-682