

THE EFFECT OF PREOPERATIVE BASELINE VALUES ON DYNAMIC HIP FUNCTION IN CHILDREN WITH CEREBRAL PALSY FOLLOWING PSOAS LENGTHENING SURGERY.

Muthusamy, Komalam, MRCS¹, Seidl, Adam J, BS¹, Friesen, Richard M, BA¹, Zhaoxing, Pan, Ph.D.², Carollo, James J, Ph.D. P.E.¹, Chang, Franklin M, MD¹.
¹Center for Gait and Movement Analysis (CGMA), The Children's Hospital Denver, CO, USA. ²Research Institute, The Children's Hospital Denver, CO, USA.

Summary/Conclusions

The preoperative baseline value for 10 of 11 variables tested showed positive correlation to the extent of postoperative pelvic tilt improvement, and a maximum anterior pelvic tilt threshold of 13 degrees greater than normal was found to correlate with the best improvement in anterior pelvic tilt following psoas lengthening surgery.

Introduction

Debate exists as to whether psoas lengthening surgery is effective in alleviating hip flexion deformity in children with cerebral palsy (CP).[1,2] The purpose of this retrospective study was to evaluate the effect of psoas lengthening (PL) surgery, with and without concomitant hamstring lengthening (HL) surgery, when the preoperative baseline values of dynamic hip function were taken into account.

Statement of clinical significance

The results of this study have prompted a re-evaluation of our patient selection criteria for PL surgery, and may be an important preoperative indicator in selecting appropriate surgical candidates.

Methods

Forty seven children (91 legs) with CP underwent PL surgery as part of their single event multi-level procedure, between the years 2000-2004. Sixty nine percent (63 legs) of these patients underwent concomitant HL. The average age of surgery was 10 years (range 3-21, SD=4)) and the average time between surgery and postoperative gait analysis was 13 months (range 8-20, SD=2).

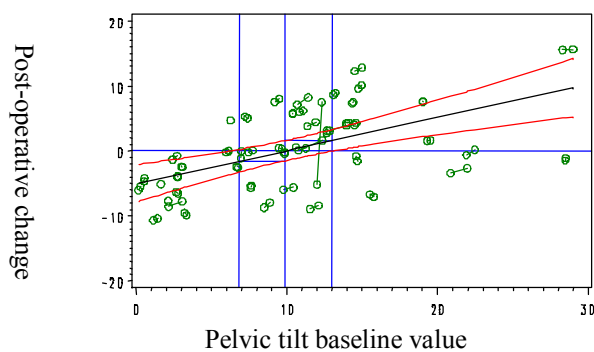
Eleven variables were used to analyze the effect of PL: Entire Cycle (EC) Hip ROM, EC Max. Hip Flexion, EC Min. HF, EC Max. Pelvic Tilt, EC Min. Pelvic Tilt, Average Pelvic Tilt (PT), Stance Max. Hip Flexion, Swing Max. Hip Flexion, Stride Length, Cadence and Walking Velocity. Statistical analysis using Student t-test was performed on the overall preoperative and postoperative results. We then used a mixed effect model to investigate the effect of preoperative baseline values, Thomas Test, age at surgery, months since surgery, concomitant surgeries and presence of walker on the kinetic variables mentioned above. Insignificant factors were removed from this model, one at a time, until every factor left in the model was statistically significant. A statistical regression model based method was applied to group the patients according to their baseline values, into three categories (less than 50% likely to improve, 50-50% likely to improve and more than 50% likely to improve). Patients were also analysed according to whether they had concomitant HL surgery, to assess the influence of HL on the overall effect of PL surgery.

Results

The only variable to show a significant change ($p < 0.05$) following surgery was stride length. Further analysis showed that baseline values were positively related to the extent of postoperative change for 10 of the 11 gait variables, stride length being the exception. The further the baseline value was from the normal joint value, the more favourable the postoperative change for the 10 variables mentioned above. Age was found to be a significant factor when predicting cadence, stride length and walking velocity, while preoperative Thomas Test was found to be a significant factor in predicting the EC Hip ROM. The worse the preoperative Thomas Test value, the higher the postoperative change.

These results showed that twenty nine patients who had a preoperative pelvic tilt $>13^\circ$ over normal (lab normal value: 12°) fell in the “more likely to improve” category and had a significant 4° postoperative change. (Figure 1). The same model was used on all 10 other variables to give us a good indication of successful surgical indicators. A mixed effect model was also used to analyse the effect of concomitant HL, and we found no significant change in pelvic tilt between patients with or without HL surgery.

Figure 1: 95% confidence interval for this value is $7^\circ - 13^\circ$.



Discussion

Preoperative baseline values should be inspected before surgical consideration. This is similar to the findings by DeLuca et al who showed in his paper that preoperative pelvic tilt influenced the outcome of the postoperative pelvic position. [3] Our results have shown better surgical success on patients who had $>25^\circ$ of preoperative anterior pelvic tilt. Concomitant HL did not significantly alter the effect of PL on anterior PT, therefore we can conclude that both PL and HL surgery can be performed simultaneously to reduce anterior pelvic tilt when the preoperative baseline value is $>25^\circ$.

References

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