Response to letter re: Comparison of hamstring lengthening with hamstring lengthening plus transfer for treatment of flexed knee gait in ambulatory patients with cerebral palsy

Michael D. Sussman · Michael Aiona ·
K. Patrick Do · Rosemary Pierce ·
Jing Feng · Lin Feng

Received: 25 September 2012 / Accepted: 27 September 2012 / Published online: 11 October 2012
© EPOS 2012

We thank the correspondent for his interest and thoughtful questions regarding our paper. We think the two biggest problems following hamstring surgery for flexed knee gait are: (1) achieving adequate correction and (2) maintaining correction over the subsequent years.

In order to maximize correction, we maintain patients in solid ankle-foot orthoses (AFOs) for daytime use and ground reaction AFOs for those with more severe involvement, the latter usually temporarily, since the patients frequently find them too constraining; as well as nighttime knee immobilizers for 6 months postoperatively.

We have not found any evidence of “overdose” in the patients in this series. All patients in the hamstring transfer plus lengthening (HST) group had lengthening of the semimembranosus and biceps, along with transfer of the gracilis and semitendinosus, while in a few patients in the hamstring lengthening alone (HSL) group, the biceps was left intact. Knee recurvatum did not occur in any patient in this series, probably because we were careful to deal with tight gastrocnemius, when it was present, to avoid pathologic plantar flexion–knee hyperextension couple. Regarding hip extension range and power, there was a small reduction in the HSL group, whereas there was a gain in both parameters in the HST group. Furthermore, hip extension power was preserved or improved in 12/13 patients in the HST group, as compared with only 2/14 in the HSL group. We did not assess step length, but we did look at stride length in those patients walking without assistive devices, and found that there was a statistical increase in stride length in the HST group, and a smaller

increase, which was not significant, in the HSL group. However, preoperatively, the HST group had a shorter stride length than the HSL group. We attach the transfer with minimal tension in order not to limit swing phase flexion of the hip, which may explain the difference between our study patients and Gage’s experience.

There are many factors which influence pelvic tilt, including balance between hip flexors and extensors, position of the femur relative to the vertical axis, tightness of low back extensors, and balance issues. If a patient with hamstring tightness is walking in 20° of knee flexion, then the femur is canted 20° from the vertical. If the knee flexion is corrected, then the femur will become vertical and the pelvic tilt will be increased by 20°. If the anterior pelvic tilt is increased less than this, then the anterior tilt of the pelvis relative to the femur will actually be improved by reducing the hip flexion. To further reduce the anterior pelvic tilt, the iliopsoas tendon can also be released or lengthened, which may be the primary factor leading to anterior pelvic tilt. There was a period when Dr. Gage felt that, in some patients, knee flexion in gait is secondary to excessive hip flexor activity and/or hip flexion contracture, and knee flexion could be treated by correction of the hip flexion alone. In the HST group, the knee flexion in mid-stance was improved by 13.7°, and the pelvic tilt increased only by 6.5°. This means that there was about a 7° improvement in hip extension relative to the pelvis, while in the HSL group, the improvement in knee flexion was 8.5° and the pelvic tilt increased by 2.5°, yielding a 6° improvement in hip extension.

In conclusion, our major concern was optimizing correction while maximizing motion and power, and minimizing recurrence, rather than “overdose,” which we did not find. We feel that if one treats only 3 of the 4 hamstrings, leaving the biceps intact, then it will remain a

M. D. Sussman (✉) · M. Aiona · K. P. Do · R. Pierce · J. Feng ·
L. Feng
Shriners Hospitals for Children, Portland, OR, USA
e-mail: msussman@shrinenet.org

deforming force, and lead to lesser correction and more rapid recurrence of deformity, basically an “inadequate dose” of surgery. Every intervention has side effects, and if maximizing the weakening of the hamstrings, by the inclusion of all hamstrings, causes a mild increase in anterior pelvic tilt, but reduces the degree of knee flexion in stance with its negative long-term effects, and propensity to worsen with time, this may be a worthwhile tradeoff. Furthermore, in the transfer patients, there was a gain in both hip extension range and power—certainly no overdose there. Perhaps correction could be maximized and maintained better with patellar tendon shortening, but we have

no data on this. If the dose was correct using limited hamstring release, then this patient group would have no need for further bony realignment surgery by anterior hemiepiphysiodesis or osteotomy.

We also postulated that moving the tendon attachment sites in the transfer group to above the knee, in order to prevent regrowth to their original attachment site, would decrease the recurrence of knee flexion, which is so common, particularly in younger patients—so stay tuned; hopefully, we will have this data by the end of this year.

Conflict of interest None.