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A comparison of two sequences of pelvic angle calculation in patients with a stiff hip

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Summary

The results from a study, comparing the conventional cardan angle sequence of rotations for pelvic angle definition (tilt, obliquity, rotation, TOR) and the sequence of rotation, obliquity, tilt (ROT) are presented for 13 patients with femoral head avascular necrosis (AVN). Pelvic angle alignment and excursion were compared and evaluated against visual observation and examined fixed hip deformities. Differences in pelvic waveforms were identified in six cases for whom the ROT sequence reflected the visual and clinical findings more accurately. There were minimal or no differences in eight cases. These results support the use of the ROT sequence in this population.

Conclusion

For patients with stiff hips who present with large excursions of pelvic tilt and rotation, the ROT sequence for pelvic angle definition appears to be more clinically relevant than the conventional TOR sequence.

Introduction

It has been proposed that the pelvic angle sequence of ROT is more clinically meaningful in patients with a large range of pelvic tilt and rotation [1]. We noted in patients with unilateral femoral head AVN, who present with large pelvic excursions and pelvic asymmetry [2], the pelvic obliquity angles calculated using the TOR sequence did not consistently reflect clinical presentation. We therefore compared the TOR and ROT order of rotations in a cohort of patients with this diagnosis.

Patients/materials and methods

A standard three-dimensional gait analysis was performed on 13 patients with femoral head AVN using a 6-camera Vicon® Workstation system, Kistler® force platform and Plug in Gait® software. A representative trial was selected for each patient and processed using the TOR and ROT orders of rotations. The resultant pelvic outputs were compared visually with each other; to clinical presentation using video footage (coronal plane only); and with the measured fixed hip deformities.

Results

The cohort comprised six males and five females, mean age 15 years (range 13–16). In two cases, pelvic obliquity was reversed using the ROT vs. TOR sequence (Fig. 1) and was corroborated by visual analysis and the predicted obliquity of the measured fixed hip ab/adduction contracture. There were no marked differences in tilt and rotation. In four cases, pelvic obliquity was increased with the ROT vs. TOR sequence and concurred with the magnitude of fixed hip adduction contracture. There was a concurrent reduction in transverse plane excursion. In seven cases there were minimal or no differences between the ROT and TOR pelvic angles.

Discussion

This study has revealed that the ROT and TOR sequences can result in differing outputs of pelvic alignment and excursion. Where differences were evident, the ROT sequence provided a closer reflection of the visual and clinical findings in this patient population. It is recognised that there is a need for standardisation in data processing, however, these data support the need to reconsider a change from the current conventional pelvic angle calculation. The use of the ROT sequence is supported further by the number of "no difference" cases.

References

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doi:10.1016/j.gaitpost.2009.08.056

Day 2 – 18 September,
Session 7: Amputees, Orthoses and Footwear, *11:30–13:00*,
Council Chamber

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The effect of bilateral AFO use in diplegic cerebral palsy

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Summary

It was hypothesised that bilateral ankle foot orthoses (AFOs) in diplegic cerebral palsy (DCP) would improve gait quality as measured by the Gait Deviation Index (GDI) [1]. Retrospective analysis of gait data for 35 subjects showed no significant improvement in GDI when comparing barefoot gait and gait in AFOs. Subjects were then split into two subgroups: those whose average knee stance flexion moment increased and those where it decreased when wearing AFOs. Those subjects with a decreased moment showed a concomitant statistically significant improvement in GDI when comparing barefoot to AFO gait.

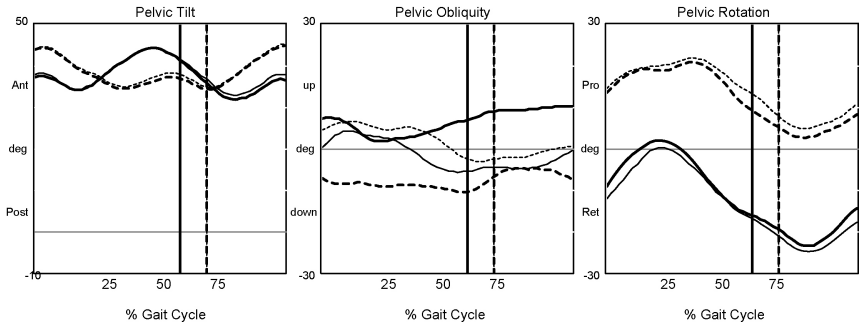

Fig. 1. Pelvic angles for one patient calculated using the TOR sequence (thin trace, affected side solid, unaffected side dashed) and the ROT sequence (bold trace, affected side solid, unaffected side dashed).