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Comparison of pelvic movements during walking in patients with cerebral palsy pre- and post-treatment

Neha Saindane, Sheila Gibbs, Rami Abboud, Weijie Wang*

Institute of Motion Analysis and Research, Ninewells Hospital and Medical School
University of Dundee, Dundee, UK.



INTRODUCTION

Cerebral palsy (CP) is the most common childhood disorder. Spastic CP accounts for 70% of the cases. Due to imbalance of the muscles, there is ill effect on pelvis such as abnormality in pelvic tilt, obliquity or rotation. This ultimately affects the gait and energy expenditure.

AIMS

1. To compare pre- and post-treatment pelvic movement in CP patients.
2. To compare these findings with a group of normal children.

METHODS AND MATERIALS

Gait analysis data, collected using Vicon® system, of 43 patients out of 153 were selected. These patients were divided into two groups:

- **Group 1:** those treated with botulinum toxin ($n=20$).
- **Group 2:** those treated surgically ($n=23$).

Fifteen out of 23 in surgery group had undergone soft-tissue surgery alone (**Group 2a**), while eight operated with derotation osteotomy with or without soft-tissue surgery (**Group 2b**).

Pelvic tilt, obliquity and rotation in X, Y, Z-axes, respectively were calculated using Vicon® Nexus software. Statistical analysis was done using paired *t* test in SPSS® software.

The normal children (**Group 3**) ($n=21$) was compared using ANOVA test.

RESULTS ...

Group 1: The results showed significant improvement in the form of decrease in pelvic tilt by 1.6° .

Group 2a: Results demonstrated improvement in minimum pelvic tilt and obliquity (**Table 1**), but range of motion increased in sagittal and transverse plane.

Group 2b: In contrast to above, range of motion decreased in coronal (by 1.9°) and transverse plane (by 4.2°) in derotation group (**Table 2**).

Group 3: When compared to injection group showed significant difference even post-treatment. However, in post-surgery group, in case of maximum pelvic rotation there was no significant difference ($p=0.145$) (**Figure 1**).

... RESULTS

Group 2b: In contrast to above, range of motion decreased in coronal (by 1.9°) and transverse plane (by 4.2°) in derotation group (**Table 2**).

Group 3: When compared to injection group showed significant difference even post-treatment. However, in post-surgery group, in case of maximum pelvic rotation there was no significant difference ($p=0.145$) (**Figure 1**).

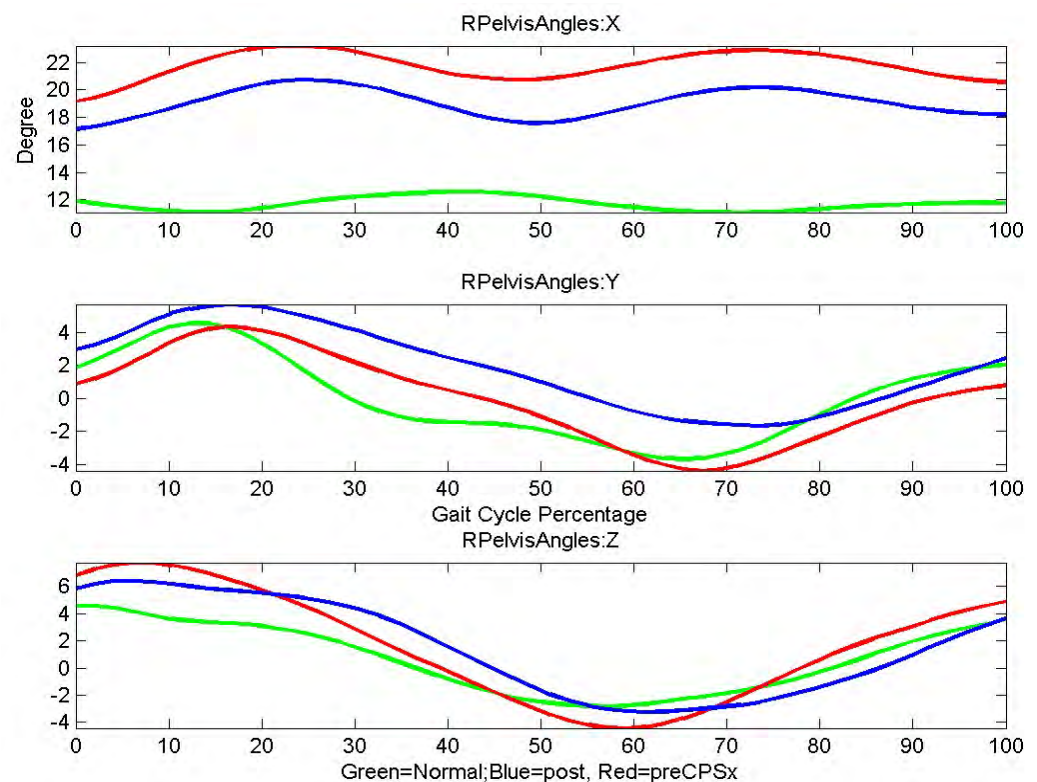


Figure 1. Comparative graphs of pelvic movements in surgery group

Table 1. Mean difference in pelvic positions in pre- and post-treatment groups.

		Group 1	Group 2a	Group 2b
Pelvic Tilt	Max.	1.6 ± 5.4 (0.031)	0.2 ± 6.1 (0.79)	-2.6 ± 7.3 (0.05)
	Min.	0.9 ± 5.3 (0.17)	1.3 ± 5.1 (0.033)	-3.0 ± 8.7 (0.06)
Pelvic Obliquity	Max.	0.2 ± 4.9 (0.78)	1.3 ± 5.0 (0.03)	-0.3 ± 3.8 (0.06)
	Min.	0.2 ± 4.2 (0.73)	1.8 ± 6.4 (0.02)	-2.2 ± 5.0 (0.018)
Pelvic Rotation	Max.	0.9 ± 7.7 (0.37)	-3.9 ± 10.3 (0.002)	2.7 ± 9.4 (0.12)
	Min.	0.9 ± 8.5 (0.43)	-1.3 ± 7.4 (0.09)	-1.4 ± 10.5 (0.45)

(Note: p-value is given in bracket. Negative values indicate increase in the angle).

Table 2. Mean differences in pelvic range of motion pre- and post-treatment.

Pelvic range of motion	Group 1	Group 2a	Group 2b
Sagittal plane	0.6 ± 2.8 (0.10)	-1.2 ± 3.5 (0.007)	0.3 ± 2.6 (0.46)
Coronal plane	-0.02 ± 5.1 (0.97)	-0.6 ± 5.3 (0.34)	1.9 ± 4.8 (0.031)
Transverse plane	0.02 ± 7.0 (0.98)	-2.4 ± 8.5 (0.02)	4.2 ± 8.0 (0.007)

DISCUSSION

Thus far, some authors have proclaimed improvement in pelvic abnormalities (Chung *et al.* 2008), while some have demonstrated no change after treatment (Ounupuu *et al.* 2002). The current study also showed improvement in certain parameters of pelvis and no change in other, in three different groups. These differences of results amongst these studies might be due to differences in patient selection and in surgical procedures.

CONCLUSION

Although the results were encouraging, especially in surgery group, it is recommended to co-relate gait analysis findings clinically because of the multi-factorial origin of the pelvic abnormalities.