

Combined Pelvic Osteotomy and Proximal Femur Guided Growth for Severe Hip Subluxation in Cerebral Palsy Patients

Hsiang-Chieh Hsieh¹, Wang Chun-Chieh, Chia-Che Lee², Ting-Ming Wang², Ken N Kuo, Kuan-Wen Wu

¹National Taiwan University Hospital Hsin-Chu Branch, ²National Taiwan University Hospital

INTRODUCTION:

More than one-third of children with cerebral palsy (CP) have hip displacement which typically is progressive, leading to ultimate dislocation. Recently, guided growth of proximal femoral capital physis by a transphyseal screw has successfully been in slow correction of head-shaft deformity and migration percentage (MP). However, progressive hip subluxation needing invasive osteotomies was reported in patients with higher levels of gross motor function (GMFCS). This study aims to analyze the result of combined proximal femoral capital physis guided growth with pelvic osteotomy for severely displaced hips in cerebral palsy children.

METHODS: We retrospectively studied data on children with CP who underwent combined proximal femur guided growth and pelvic osteotomy surgical procedures from 2016 to 2020 at a single institution. The indication for combined pelvic osteotomy and proximal femoral guided growth was children whose GMFCS level were 3 to 5 with spastic hip and progressive hip displacement on one or both sides (MP>40%) and coxa valgus deformity (HSA>155 degree). Patients without minimal follow-up less than 2 years were excluded. During the period, there were a total 36 hips out of 22 patients retrieved (table 1). Radiographic outcomes of head shaft angle(HSA), MP, acetabular index (AI), center-edge angle(CEA) and Hilgenreiner's epiphyseal angle(HEA) were measured. The outcome was compared to another earlier group of patients who received varus derotation osteotomy of femur as salvage procedure after failure of guided growth only surgery.

RESULTS:

All radiographic measurements had statistically improved at final visit (Table 2). The mean HAS, MP, AI, CEA and HEA improved after surgery (HSA: 168° ±7° before versus 159° ± 8° after; MP: 52% before versus 24% after; AI: 23° ± 5° before versus 15° ± 5° after; CEA: 4° ± 12° before versus 18° ± 12° after; HEA: 8° ± 9° before versus 18° ± 9° after). There was no revision surgery for progressive subluxation during the follow up period even though 4 hips remained subluxated with MP over 50%. In comparison to patients receiving varus derotation osteotomy after failure of the surgery with guided growth only, the pre-operative and final MP were not significantly different (table 3).

DISCUSSION AND CONCLUSION: Patients with higher GMFCS level and advanced migration percentage were at higher risk of failure after surgery with guided growth only. The result revealed that combined pelvic osteotomy and proximal femoral capital physis guided growth may reduce the failure and avoid further salvage procedure such as varus derotational osteotomy.

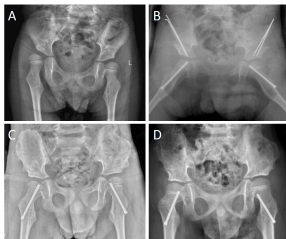


Table 1. Demographic data

Patients (boys/girls)	22 (12/14)
Number of hips	36
Age at surgery (years)	5.9 (range 3.6-11.1)
Followup (months)	39.6 (25-72)
GMFCS level	
III	6
IV	13
V	3
Adductor tenotomy	13
Revision of transphyseal screw	16 hips (9 patients)

Table 2. Radiographic measurements at preoperative and final follow-up

Variable	Preoperative		Final follow-up		Mean ± SD	SD(SD)	P value
	Mean ± SD	SD(SD)	Mean ± SD	SD(SD)			
HSA	167.9 ± 7.4	(160.9 to 170.4)	159.1 ± 8.3	(156.3 to 162)	8.8 ± 8.4	(5.0 to 11.0)	<0.001
AI	23.1 ± 5.1	(21.0 to 25.1)	15.3 ± 5.4	(14 to 17)	8.15	(6.3 to 9.7)	<0.001
CEA	4.3 ± 12.1	(0.6 to 8.2)	18.2 ± 12.1	(14.1 to 22.3)	13.8 ± 14.1	(9 to 18.4)	<0.001
HEA	7.6 ± 8.3	(1.3 to 10.4)	17.7 ± 8.8	(14.7 to 20.7)	10.1 ± 8.8	(6.7 to 13.4)	<0.001
	Mean	SD	Mean	SD	Mean		
MP*	51.7	15.2	24.6	13.6	27.3		<0.001

*Wilcoxon signed rank test, SD, interquartile range

Table 3. Comparison of radiological measurements between the two groups.

Variable	Guided growth only with failed	Combined guided growth with pelvic osteotomy on 36	P value
Mean HSA			
Preoperative	166.2	167.9 ± 7.4 (160.9 to 170.4)	P=0.53
Final follow-up	137.4	159.1 ± 8.3 (156.3 to 162)	P=0.001
Mean MP			
Preoperative	54	51.7	P=0.2*
Final follow-up	42	24.6	P=0.1*
Mean HSA			
Preoperative	28.4	23.1 ± 5.1 (21.0 to 25.1)	P=0.1
Final follow-up	19.2	15.3 ± 5.4 (14 to 17)	P=0.004
Mean CEA			
Preoperative	6.8	7.6 ± 8.3 (1.3 to 10.4)	P=0.79
Final follow-up	31	17.7 ± 8.8 (14.7 to 20.7)	P=0.001
Mean HEA			
Preoperative	8.4	7.6 ± 8.3 (1.3 to 10.4)	P=0.06
Final follow-up	11.1	17.7 ± 8.8 (14.7 to 20.7)	P=0.17

*Mean Wilcoxon's test