Crouch Gait in Spastic Diplegia: Patient Outcome

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Case Outcome

Based on the history, physical exam, and the gait analysis, it was decided to perform bilateral distal femoral extension osteotomies, with patellar tendon shortening, along with bilateral tibial derotational osteotomies. Her postoperative care included a Robert Jones type dressing for 48 hours with the knee in flexion to protect the sciatic nerve. That was transitioned to a long leg cast for 4 weeks. After that, she was placed in solid AFOs and hinged knee braces, allowing her to advance her knee flexion as tolerated, keeping maximum knee extension in stance. She returned for a postoperative gait analysis 24 months later. Figure 1 shows a marked improvement in knee extension on physical exam and Figure 2 shows a significant improvement in her GDI. Her preoperative hip flexion contracture was only 10 degrees, and it was decided not to do a psoas over-the-brim lengthening. However, her pelvic tilt has unfortunately increased (Figure 3) with an associated increased hip flexion in midstance, and her hip internal rotation on the left has improved, but incompletely corrected (Figure 4). Knee kinematics show a remarkable improvement in her minimum knee flexion in midstance and improved external tibial torsion (Figure 5), and radiographs show healed femoral osteotomies (Figure 7).

Figure 1. Postoperative Physical Exam

	PASSIVE ROM				STRENGTH			
	Right		Left		Right		Left	
Hip Flex	95	110	105	110	3+	4	3	4
Hip Ext	-28	-10	-40	-10	3+	2	3+	2
Hip Abd	9	15	12	20	3	2	3	2
Hip Int Rot	47	50	40	70				
Hip Ext Rot	43	45	10	14				
Knee Ext	-9	-24	-7	-34	3-	3+	3-	3+
Knee Flex	130	WNL	145	WNL	2	2+	2-	2+
Pop Angle	75 70	80 75	35 25	80 70				
Ely Test	110	120	60	100				
Dorsi (flex)	5	12	7	7	2	1	2	1
Dorsi (ext)	0	5	-3	2				
Plantar	28	28	22	15	2	1	2-	1
Ankle Inv	35	20	45	25	2-	1	2-	1
Ankle Ever	22	15	-8	15	2	1	1	1
TMA	15 EXT	20 EXT	20 EXT	35 EXT				
TFA	15 EXT	7 EXT	16 EXT	25 EXT				
FF AB/ADD	10 ABD	7 ABD	6 ADD	4 ABD				
Calcaneal Inv	6	8	8	4				
Calcaneal Ever	-6	5	-8	4				
Leg Length	81.5	81.0	81.3	79.5				
Knee Varus/Valgus	0 Varus		4 Varus					

KEY	
0	No palpable contraction or observable movement.
1	Contraction in the muscle but no observable movement
1+	Visible movement of the part but <50% through the available range in a gravity-eliminated position.
2-	>50% AROM through the available range in a gravity-eliminated position.
2	Full AROM through the available range in a gravity-eliminated position.
2+	Full AROM with some manual resistance in a gravity-eliminated position.
3-	>50 AROM through the available range against gravity.
3	Full AROM through the available range against gravity.
3+,4-	Full AROM against gravity - minimal manual resistance.
4,4+	Full AROM against gravity - moderate manual resistance.
5	Full AROM against gravity - maximal manual resistance.

(Green = preop, Red = postop)

Figure 2. Postoperative Temporodistance Parameters

	Right Side Measures				Left Side Measures		
	03/02/17	12/05/13		Normal	03/02/17	12/05/13	
Step Length Avg (cm)	32.50 (2.47)	33.51 (6.49)		63.75-71.53	34.16 (2.55)	47.29 (6.40)	
Step Length Avg (Normalized)	0.21 (0.02)	0.23 (0.04)		0.39-0.43	0.22 (0.02)	0.32 (0.04)	
Stride Length Avg (cm)	66.64 (3.67)	80.70 (10.88)		127.77-142.55	66.64 (3.72)	81.09 (10.86)	
Stride Length Avg (Normalized)	0.43 (0.02)	0.55 (0.07)		0.78-0.88	0.43 (0.02)	0.55 (0.07)	
Forward Velocity Avg (cm/s)	40.60 (4.11)	63.65 (14.92)		117.44-145.26	40.34 (4.20)	64.60 (14.83)	
Forward Velocity Avg (/s)	0.26 (0.03)	0.43 (0.10)		0.71-0.89	0.26 (0.03)	0.44 (0.10)	
Cadence Avg (steps/min)	72.99 (5.59)	94.07 (15.07)		105.33-127.85	72.56 (6.20)	95.60 (14.98)	
Total Support Time (%)	69.67 (2.37)	58.03 (5.92)		57.59-61.67	68.06 (3.47)	57.36 (8.56)	
Single Support Time (%)	31.94 (3.47)	42.64 (8.56)		38.33-42.41	30.33 (2.37)	41.97 (5.92)	
Step Width (cm)	10.88 (0.88)	15.17 (2.01)		7.20-11.90			
Step Width (Normalized)	0.07 (0.01)	0.10 (0.01)		0.05-0.07			
GDI	72.93 (1.34)	62.34 (2.58)		90.00-110.00	58.16 (1.33)	45.22 (1.73)	
Gait Profile Score (Average)	10.94 (1.16)	13.29 (1.91)		5.30-7.38	13.81 (1.44)	18.66 (2.06)	
Arm Posture Score (Average)	NaN (NaN)			12.30-18.38	NaN (NaN)		

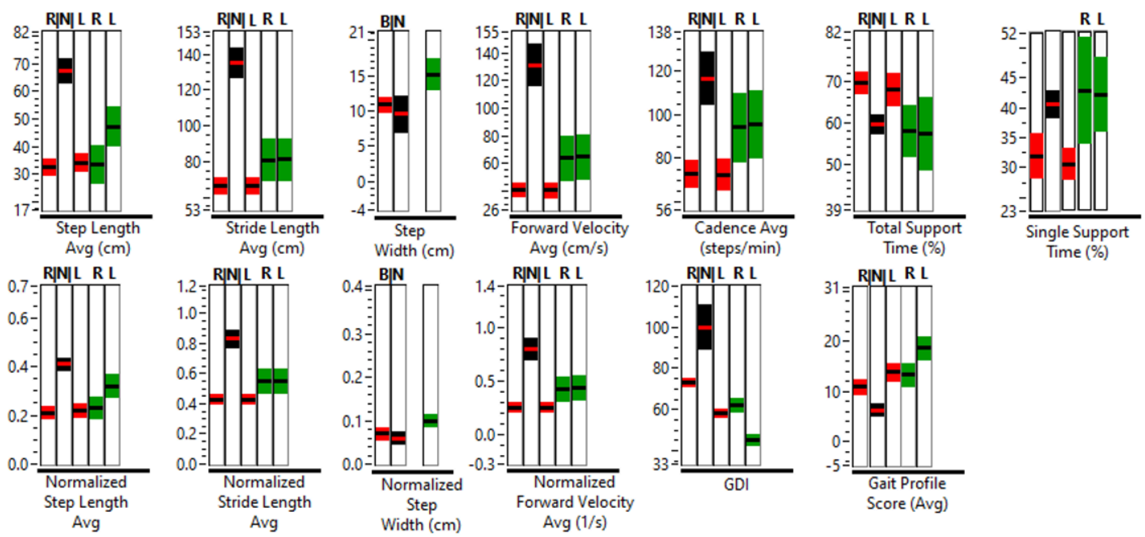

Figure 3. Postoperative Pelvic Kinematics

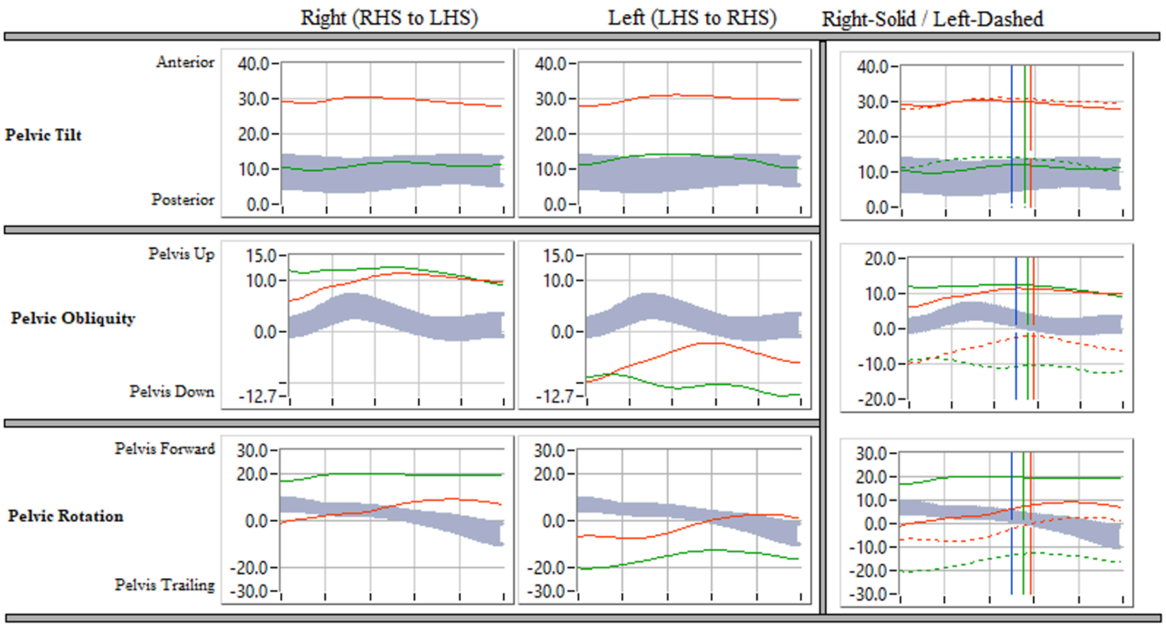

Figure 4. Postoperative Hip Kinematics

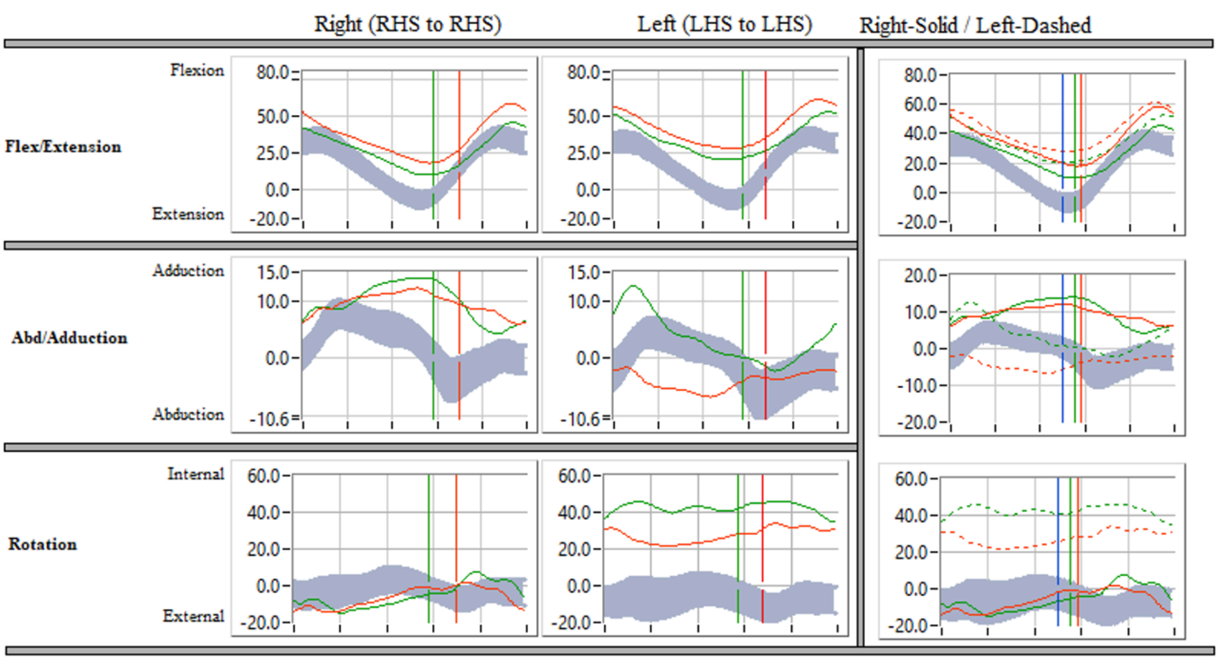

Figure 5. Postoperative Knee Kinematics

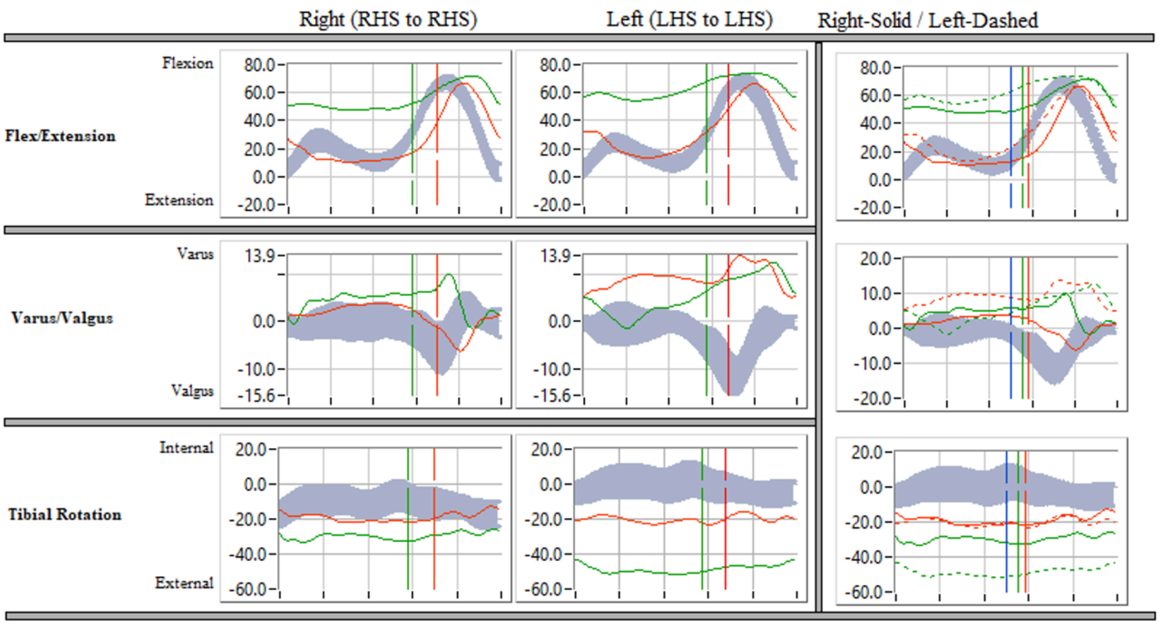

Figure 6. Postoperative Ankle Kinematics

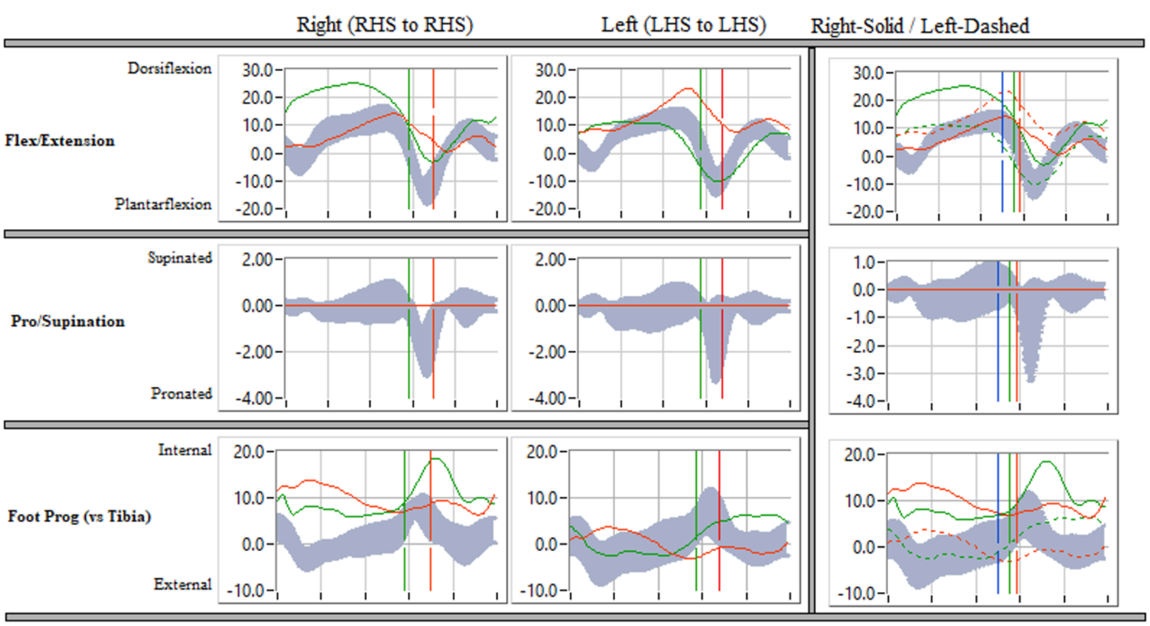

Figure 7. Postoperative Radiographs