Additional file 1

Supplementary Tables S1–S4

Table 1: Changes in Coronal Alignment Parameters With and Without Subtrochanteric Shortening Osteotomy

	Without STO ($n = 37$)			With STO ($n = 49$)			
Parameter	Preoperative	Postoperative	Change (95% CI)	Preoperative	Postoperative	Change (95% CI)	P Value
HKA (°)	184.1 ± 3.8	181.5 ± 3.8	-2.6 (-3.4 to -1.7)	183.7 ± 3.5	181.3 ± 3.9	-2.3 (-3.1 to -1.6)	0.701
FMA (°)	96.3 ± 2.7	93.4 ± 2.7	-2.9 (-3.6 to -2.2)	95.9 ± 2.7	93.5 ± 3.1	-2.5 (-3.0 to -1.9)	0.299
TMA (°)	88.6 ± 2.1	88.5 ± 2.2	-0.1 (-0.4 to 0.2)	88.8 ± 2.0	89.0 ± 2.2	0.2 (-0.1 to 0.6)	0.140

Values are mean ± SD. Change was calculated as postoperative minus preoperative and is presented as mean (95% CI). P values compare changes between groups. Abbreviations: CI, confidence interval; FMA, femoral mechanical angle; HKA, hip–knee–ankle angle; SD, standard deviation; STO, subtrochanteric shortening osteotomy; TMA, tibial mechanical angle.

Table 2: Preoperative and Postoperative Distributions of FMA, TMA, and HKA Phenotypes

Angle	Phenotype	Preoperative, n (%)	Postoperative, n (%)
FMA	VAR 6°	0 (0.0)	3 (3.5)
FMA	VAR 3°	4 (4.7)	19 (22.1)
FMA	NEU 0°	20 (23.3)	30 (34.9)
FMA	VAL 3°	31 (36.0)	29 (33.7)
FMA	VAL 6°	29 (33.7)	5 (5.8)
FMA	VAL 9°	2 (2.3)	0 (0.0)
TMA	VAR 3°	5 (5.8)	3 (3.5)
TMA	NEU 0°	37 (43.0)	36 (41.9)
TMA	VAL 3°	35 (40.7)	36 (41.9)
TMA	VAL 6°	9 (10.5)	11 (12.8)
HKA	VAR 9°	0 (0.0)	1 (1.2)
HKA	VAR 6°	0 (0.0)	7 (8.1)
HKA	VAR 3°	5 (5.8)	12 (14.0)
HKA	NEU 0°	20 (23.3)	17 (19.8)
HKA	VAL 3°	20 (23.3)	29 (33.7)
HKA	VAL 6°	28 (32.6)	17 (19.8)
HKA	VAL 9°	10 (11.6)	3 (3.5)
HKA	VAL 12°	3 (3.5)	0 (0.0)

Phenotypes were assigned in 3° categories centered at 93° for FMA, 87° for TMA, and 180° for HKA. Abbreviations: FMA, femoral mechanical angle; HKA, hip–knee–ankle angle; NEU, neutral; TMA, tibial mechanical angle; VAL, valgus; VAR, varus.

Table 3: Observed FMA, TMA, and HKA Phenotype Transition Patterns

Angle	Preoperative Phenotype	Postoperative Phenotype	Patients, n (%)
FMA	VAL 6°	VAL 3°	24 (27.9)
FMA	VAL 3°	NEU 0°	20 (23.3)
FMA	NEU 0°	VAR 3°	14 (16.3)
FMA	VAL 3°	VAR 3°	4 (4.7)
FMA	VAL 6°	NEU 0°	4 (4.7)
FMA	VAL 3°	VAL 6°	2 (2.3)
FMA	VAL 9°	VAL 6°	2 (2.3)
FMA	VAR 3°	VAR 6°	2 (2.3)
FMA	NEU 0°	VAR 6°	1 (1.2)
FMA	VAR 3°	NEU 0°	1 (1.2)
TMA	NEU 0°	VAL 3°	4 (4.7)
TMA	VAL 3°	VAL 6°	3 (3.5)
TMA	VAL 3°	NEU 0°	1 (1.2)
TMA	VAL 6°	VAL 3°	1 (1.2)
TMA	VAR 3°	NEU 0°	2 (2.3)
HKA	VAL 6°	VAL 3°	16 (18.6)
HKA	NEU 0°	VAR 3°	9 (10.5)
HKA	VAL 3°	NEU 0°	7 (8.1)
HKA	VAL 9°	VAL 6°	6 (7.0)
HKA	NEU 0°	VAR 6°	4 (4.7)
HKA	VAL 6°	NEU 0°	4 (4.7)
HKA	VAL 9°	VAL 3°	4 (4.7)
HKA	VAL 12°	VAL 9°	3 (3.5)
HKA	VAL 3°	VAL 6°	3 (3.5)
HKA	VAR 3°	VAR 6°	2 (2.3)
HKA	NEU 0°	VAL 3°	1 (1.2)
HKA	VAL 3°	VAR 3°	1 (1.2)
HKA	VAL 3°	VAR 6°	1 (1.2)
HKA	VAR 3°	VAR 9°	1 (1.2)

Only observed phenotype transitions are shown. Abbreviations: FMA, femoral mechanical angle; HKA, hip–knee–ankle angle; NEU, neutral; TMA, tibial mechanical angle; VAL, valgus; VAR, varus.

Table 4: Preoperative and Postoperative CPAK Type Distributions

CPAK Type	Preoperative, n (%)	Postoperative, n (%)
I	0 (0.0)	3 (3.5)
II	17 (19.8)	18 (20.9)
III	59 (68.6)	35 (40.7)
IV	1 (1.2)	7 (8.1)
V	1 (1.2)	10 (11.6)
VI	8 (9.3)	12 (14.0)
VII	0 (0.0)	0 (0.0)
VIII	0 (0.0)	1 (1.2)
IX	0 (0.0)	0 (0.0)

CPAK types were defined by aHKA and JLO. Abbreviations: aHKA, arithmetic hip–knee–ankle angle; CPAK, Coronal Plane Alignment of the Knee; JLO, joint-line obliquity.