



“Together,
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Five Millimeters from Greater Tuberosity to Tip of PHILOS: Fact or Myth?

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Introduction and Background

While the utilizing greater tuberosity(GT) as a reference for PHILOS placement in proximal humerus fracture is commonly advocated. The explicit distance between GT and upper border of PHILOS and its correlation with clinical outcomes remains unclear.

Material and Method

Patients diagnosed of displaced proximal humerus fracture underwent PHILOS fixation from January 2017 to May 2022 were included. Shoulders that did not meet the criteria for good reduction were excluded. Demographic and postoperative radiographic data were collected. Clinical outcomes, including range of motion (ROM) and functional outcomes, were evaluated at 1 year postoperatively. Patients were divided into two groups based on by GT to plate (GT-P) distance: group 1 (GT-P distance ≥ 5 mm) and group 2 (GT-P distance < 5 mm).

Results

46 patients were included: 27 in group 1 and 19 in group 2. Group 1 had significantly greater height and weight ($p = 0.013$ and 0.19 , respectively) and larger humeral head diameter (50 mm vs 45 mm, $p = 0.003$). Distance from calcar screw to humeral head calcar did not differ. At 1 year, group 1 had significantly greater forward elevation ($p = 0.001$) and internal rotation ($p = 0.047$), while functional scores (CSS, ASES, SPADI) were similar. ROC analysis identified a threshold of ≥ 4.8 mm for achieving forward flexion $> 120^\circ$.

Conclusions

GT to plate distance less than 5 mm may not significantly affect functional outcomes, except for forward elevation. An optimal greater tuberosity to plate distance of at least 4.8 mm is recommended for achieving forward elevation greater than 120° . Care should be taken in patients with hyposthenic bulid and small humeral head diameter, as this may result in a GT-P distance < 5 mm, impacting proper calcar distance.



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Figure & Table 1.

Result

Table 1. Demographic data	Total (n=46)	Group 1 ^a (n=27)	Group 2 ^b (n=19)	<i>p</i> -value
Age (year, mean ± SD)	61.87 ± 16.54	55.14 ± 17.02	64.81 ± 15.69	0.067
Gender (M or F)				0.101
• Female	30 (65.22)	15 (55.56)	15 (78.95)	
• Male	16 (34.78)	12 (44.44)	4 (21.05)	
Affected side(%Dominant)	45.7%	44.4%	47.4%	0.845
Weight	62.78 ± 11.28	66.01 ± 10.96	58.19 ± 10.34	0.019*
Height	160.04 ± 9.34	162.85 ± 9.41	156.05 ± 7.83	0.013*
BMI	24.61 ± 4.01	24.88 ± 3.66	24.22 ± 4.54	0.585
Underlying; DM (% DM)	10 (21.74)	5 (18.52)	5 (26.32)	0.719
ASA				0.102
• 1	10 (21.74%)	8 (29.63%)	2 (10.53%)	
• 2	34 (73.91%)	19 (70.37%)	15 (78.95%)	
• 3	2 (4.35%)	0	2 (10.53%)	
Neer classification				0.051
• 2	8 (17.39%)	2 (7.41%)	6 (31.58%)	
• 3	38 (82.61%)	25 (92.59%)	13 (68.42%)	
Head size (Diameter,mm)	48.36 ± 5.06	50.18 ± 4.12	45.76 ± 5.22	0.003*
Calcar distance (mm)	3.5 ± 1.7	3.78 ± 3.5	3.1 ± 1.9	0.09

^aGT-P ≥ 5 mm
^bGT-P < 5 mm
* *p*-value < 0.005

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Figure & Table 2.

Table 2. Functional outcome				
	Total	Group 1 ^a	Group 2 ^b	<i>p</i> -value
	(n=46)	(n=27)	(n=19)	
CSS score	78.70 ± 14.22	81.00 ± 14.85	75.42 ± 12.95	0.193
ASES score	90.55 ± 11.26	90.92 ± 11.84	90.03 ± 10.67	0.794
SPADI	10.17 ± 12.59	8.98 ± 12.98	11.87 ± 12.14	0.450
Range of motion				
• Forward elevation	146.2 ± 23.81	155.19 ± 17.79	133.42 ± 25.82	0.001*
• External rotation	42.07 ± 14.36	42.41 ± 15.15	41.58 ± 13.55	0.850
• Internal rotation (level)	7.09 ± 1.92	7.56 ± 1.69	6.42 ± 2.06	0.047*
VAS	0.48 ± 0.75	0.33 ± 0.68	0.68 ± 0.82	0.121

^aGT-P ≥ 5 mm
^bGT-P < 5 mm
* *p*-value < 0.005