Electronic Appendix

Power Analysis

Pilot data suggested that there would be an 8.0-mm mean displacement for the PHN implant and a 4.0-mm mean displacement of the distal fragment in bending for the LCP-PH implant. Assuming a common standard deviation of 2.0 mm, at a significance level of 0.05, a power analysis showed that six specimens in each group would be needed to yield a power of 90%. Therefore, the pilot data suggested that an effect size of 2.0 could be detected with experimental groups of six specimens each.

TABLE E-1 Bone Mineral Density (BMD) for Each Experimental Group

The bone quality of the humeri was assessed using a dual x-ray absorptiometry scan prior to mechanical intervention.

Specimen	Bending		Torsion	
	PHN (g/cm^2)	LCP-PH (g/cm^2)	PHN (g/cm^2)	LCP-PH (g/cm^2)
1	0.315	0.606	--	0.389
2	0.661	0.665	0.405	0.514
3	0.392	0.374	0.677	0.652
4	0.473	0.396	0.387	0.414
5	0.543	0.518	0.513	0.536
6	0.526	0.488	0.611	0.720
Average	0.485	0.508	0.519	0.538
Std. Dev.	0.121	0.114	0.126	0.130

TABLE E-2 Anthropometric Measurements Between Experimental Groups

Specimen length, head circumference, and diaphyseal shaft circumference are shown for each specimen.

Bending	Length (mm)		Head Circumference (mm)		Shaft Circumference (mm)	
Specimen	**PHN**	**LCP-PH**	**PHN**	**LCP-PH**	**PHN**	**LCP-PH**
1	330.32	339.59	177.61	175.32	82.49	84.41
2	327.35	330.21	180.19	170.75	91.93	87.49
3	348.98	302.91	181.66	151.87	77.28	76.92
4	363.86	353.13	186.90	170.26	93.75	94.81
5	339.53	338.10	178.80	185.40	76.31	100.43
6	326.73	332.57	175.97	172.97	79.27	91.25
Average	339.46	332.75	180.19	171.10	83.51	89.22
St. Dev.	14.68	16.66	3.84	10.92	7.56	8.23

Torsion	Length (mm)		Head Circumference (mm)		Shaft Circumference (mm)	
Specimen	**PHN**	**LCP-PH**	**PHN**	**LCP-PH**	**PHN**	**LCP-PH**
1	--	329.26	--	166.03	--	75.04
2	336.40	346.17	162.10	198.27	72.78	109.4
3	319.00	321.28	169.50	164.71	85.69	83.81
4	412.20	356.48	171.00	171.17	89.82	81.06
5	324.74	327.47	172.24	170.83	85.66	97.86
6	311.39	365.28	172.56	182.43	78.63	88.98
Average	340.75	340.99	169.48	175.57	82.52	89.36
St. Dev.	40.97	17.70	4.30	12.75	6.77	12.48

TABLE E-3 Mode and Cycle at Failure in Torsion*

Instrumentation	Mode of Failure	Cycle No. at Failure
PHN	Diaphyseal spiral fracture through distal locking screws	750
PHN	Proximal screw cut-out of greater tuberosity	989
PHN	Proximal screw cut-out of greater tuberosity	4700
PHN	Proximal screw cut-out of greater tuberosity	5000+
PHN	Proximal screw cut-out of greater tuberosity	5000+
LCP-PH	Plate-screw construct pull-out of distal cortical bone	5000+
LCP-PH	Plate-screw construct pull-out of distal cortical bone	5000+
LCP-PH	Plate-screw construct pull-out of distal cortical bone	5000+
LCP-PH	Plate-screw construct pull-out of distal cortical bone	5000+
LCP-PH	Plate-screw construct pull-out of distal cortical bone	5000+
LCP-PH	Plate-screw construct pull-out of distal cortical bone	5000+

*The mode and cycle at failure is listed for each specimen. 5000+ indicates the specimen failed during load-to-failure testing rather than cyclic testing.