

Table S1. The biomechanical analysis of the five finite element models in flexion.

	INT		Nt45		Nt35		Nt25		Nt15	
Preload (N)	150									
Moment (Nm)	14.4		18.7		18.7		18.7		18.4	
Intervertebral range of motion (degree)										
L1-L2	5.39		6.43		6.43		6.43		6.35	
L2-L3	5.71		6.81		6.81		6.81		6.72	
L3-L4	5.71		2.28		2.31		2.38		2.47	
L4-L5	7.28		8.60		8.60		8.60		8.51	
Total	24.09		24.12		24.15		24.22		24.05	
Stress of intervertebral disc (Kpa)										
L1-L2	1080		1220		1220		1230		1270	
L2-L3	893		1130		1130		1110		1110	
L3-L4	810		543		547		548		559	
L4-L5	959		1200		1200		1180		1180	
Facet contact forces (N)										
	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
L1-L2	0	0	0	0	0	0	0	0	0	0
L2-L3	0	0	0	0	0	0	0	0	0	0
L3-L4	0	0	0	0	0	0	0	0	0	0
L4-L5	0	0	0	0	0	0	0	0	0	0
Stress of screws (MPa)										
Maximum	-		139		140		134		130	
Stress of PCU shell (Mpa)										
Maximum	-		4.7		3		3.5		4.9	
Stress of Nitinol stick (Mpa)										
Maximum	-		44		54.6		72.4		118	

Table S2. The biomechanical analysis of the five finite element models in extension.

	INT		Nt45		Nt35		Nt25		Nt15	
Preload (N)	150									
Moment (Nm)	15.1		18.4		18.4		18.4		18	
Intervertebral range of motion (degree)										
L1-L2	3.33		3.86		3.86		3.86		3.80	
L2-L3	3.17		3.65		3.65		3.65		3.60	
L3-L4	2.85		1.09		1.12		1.18		1.24	
L4-L5	3.27		3.97		3.95		3.97		3.88	
Total	12.62		12.57		12.58		12.66		12.52	
Stress of intervertebral disc (Kpa)										
L1-L2	475		542		542		542		533	
L2-L3	488		556		556		556		548	
L3-L4	414		236		236		239		240	
L4-L5	312		439		436		439		430	
Facet contact forces (N)										
	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
L1-L2	76	76	95	95	95	95	95	95	93	93
L2-L3	94	94	117	117	118	118	118	118	115	115
L3-L4	105	105	6	5	7	7	11	11	14	15
L4-L5	102	102	129	128	128	128	128	128	125	125
Stress of screws (MPa)										
Maximum	-		105		110		112		110	
Stress of PCU shell (Mpa)										
Maximum	-		5.1		2.7		3.1		4.9	
Stress of Nitinol stick (Mpa)										
Maximum	-		39.5		46		58.4		101	

Table S3. The biomechanical analysis of the five finite element models in torsion.

	INT	Nt45	Nt35	Nt25	Nt15					
Preload (N)	150									
Moment (Nm)	29.0	31.9	31.3	30.2	29.6					
Intervertebral range of motion (degree)										
L1-L2	3.85	4.13	4.07	3.96	3.91					
L2-L3	4.08	4.28	4.24	4.16	4.12					
L3-L4	4.60	3.79	4.01	4.22	4.40					
L4-L5	6.27	6.62	6.55	6.41	6.33					
Total	18.80	18.82	18.87	18.75	18.76					
Stress of intervertebral disc (Kpa)										
L1-L2	683	740	728	707	694					
L2-L3	678	722	722	687	675					
L3-L4	751	611	611	696	731					
L4-L5	927	1020	1020	968	950					
Facet contact forces (N)										
	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
L1-L2	0	336	0	371	0	363	0	349	0	342
L2-L3	0	336	0	374	0	366	0	351	0	343
L3-L4	0	336	0	213	0	245	0	285	0	323
L4-L5	0	344	0	389	0	380	0	363	0	354
Stress of screws (MPa)										
Maximum	-	211	162	107	98.9					
Stress of PCU shell (Mpa)										
Maximum	-	17.4	7.6	6	4.6					
Stress of Nitinol stick (Mpa)										
Maximum	-	219	324	383	381					

Table S4. The biomechanical analysis of the five finite element models in lateral bending.

	INT		Nt45		Nt35		Nt25		Nt15	
Preload (N)	150									
Moment (Nm)	19.1		23.2		23.2		23.2		22.6	
Intervertebral range of motion (degree)										
L1-L2	6.12		7.25		7.25		7.24		7.10	
L2-L3	6.12		7.15		7.15		7.14		7.01	
L3-L4	6.17		2.63		2.77		2.96		3.16	
L4-L5	6.45		7.79		7.78		7.76		7.62	
Total	24.86		24.82		24.95		25.10		24.89	
Stress of intervertebral disc (Kpa)										
L1-L2	1230		1510		1500		1500		1470	
L2-L3	1160		1440		1430		1430		1400	
L3-L4	1130		512		544		585		621	
L4-L5	1040		1320		1320		1320		1290	
Facet contact forces (N)										
	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
L1-L2	21	5	30	10	30	10	30	9	28	9
L2-L3	53	31	82	38	82	37	80	35	74	33
L3-L4	41	9	0	0	0	0	1	0	9	0
L4-L5	55	0	61	0	61	0	61	0	59	0
Stress of screws (MPa)										
Maximum	-		158		178		181		175	
Stress of PCU shell (Mpa)										
Maximum	-		6.8		5.1		5		7.2	
Stress of Nitinol stick (Mpa)										
Maximum	-		127		145		187		275	