

**Supplementary Table 9.** Subgroup comparisons of morphometric measurements and computed tomography HU values for overall unilateral C2 laminae between the control and BI groups based on the diagnosis of atlas occipitalization

Variable	Control group		BI group			p-value <sup>†</sup>		
	No. of unilateral laminae (A)	Non-Atlas occipitalization (A)	No. of unilateral laminae (B/C)	Atlas occipitalization (B)	Non-Atlas occipitalization (C)	A vs. B	A vs. C	B vs. C
Laminar length (cm)	406	3.16 ± 0.27	282/128	2.95 ± 0.43	3.12 ± 0.29	<0.001	0.878	<0.001
Laminar thickness (mm)	406	5.80 ± 1.18	282/128	5.36 ± 1.29	5.34 ± 1.19	<0.001	<0.001	0.860
Laminar angle (°)	406	49.53 ± 3.01	282/128	49.78 ± 5.32	48.08 ± 4.39	1.000	<0.001	<0.001
Laminar height (cm)	404	1.24 ± 0.13	162/120	1.14 ± 0.19	1.15 ± 0.13	<0.001	<0.001	1.000
Laminar HU values	406	257.48 ± 100.99	282/128	222.78 ± 118.51	233.78 ± 128.84	<0.001	0.005	1.000

Values are presented as mean ± standard deviation.

HU, Hounsfield unit; BI, basilar invagination.

<sup>†</sup>The p-value were obtained by analysis of variance test or Kruskal-Wallis test according to the result of the test for normal distribution. The nominal p-value was adjusted as 0.05 for the multiple comparisons.

**Supplementary Table 10.** Subgroup comparisons of morphometric measurements and computed tomography HU values for unilateral C2 laminae suitable for screw placement between the control and BI groups based on the diagnosis of C2-3 assimilation

Variable	Control group		BI group			p-value <sup>†</sup>		
	No. of unilateral laminae (A)	Non-C2/3 assimilation (A)	No. of unilateral laminae (B/C)	C2/3 assimilation (B)	Non-C2/3 assimilation (C)	A vs. B	A vs. C	B vs. C
Laminar length (cm)	355	3.17 ± 0.27	92/209	2.94 ± 0.46	3.09 ± 0.30	<0.001	0.013	<0.001
Laminar thickness (mm)	355	6.08 ± 1.00	92/209	5.87 ± 1.08	5.86 ± 0.90	0.055	0.040	1.000
Laminar angle (°)	355	49.39 ± 2.96	92/209	51.12 ± 6.09	48.70 ± 4.21	0.004	0.128	<0.001
Laminar HU values	355	255.92 ± 98.66	92/209	212.04 ± 102.38	213.09 ± 107.25	0.001	<0.001	1.000

Values are presented as mean ± standard deviation.

HU, Hounsfield unit; BI, basilar invagination.

<sup>†</sup>The p-value were obtained by analysis of variance test or Kruskal-Wallis test according to the result of the test for normal distribution. The nominal p-value was adjusted as 0.05 for the multiple comparisons.