

**Supplementary Table 7.** Subgroup comparisons of morphometric measurements and computed tomography HU values for overall unilateral C2 laminae between Goel A and B groups based on the diagnosis of HRVA

Variable	Goel A group			Goel B group			p-value <sup>†</sup>					
	No. of unilateral laminae (A/B)	HRVA (A)	Non-HRVA (B)	No. of unilateral laminae (C/D)	HRVA (C)	Non-HRVA (D)	A vs. B	A vs. C	A vs. D	B vs. C	B vs. D	C vs. D
Laminar length (cm)	160/82	2.85 ± 0.43	3.05 ± 0.40	105/63	3.03 ± 0.34	3.19 ± 0.29	0.001	0.002	<0.001	1.000	0.017	0.055
Laminar thickness (mm)	160/82	5.06 ± 1.19	6.01 ± 1.32	105/63	5.29 ± 1.10	5.33 ± 1.24	<0.001	1.000	0.222	0.009	0.013	1.000
Laminar angle (°)	160/82	49.81 ± 5.80	50.59 ± 4.89	105/63	48.10 ± 4.32	48.03 ± 4.12	1.000	0.118	0.002	0.043	0.001	1.000
Laminar height (cm)	71/63	1.11 ± 0.19	1.22 ± 0.18	51/97	1.12 ± 0.12	1.13 ± 0.15	0.003	1.000	1.000	0.001	0.009	1.000
Laminar HU values	160/82	234.50 ± 135.71	191.74 ± 78.17	105/63	235.61 ± 125.38	234.87 ± 121.91	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Values are presented as mean ± standard deviation.

HRVA, high-riding vertebral artery; HU, Hounsfield unit.

<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 8.** 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 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)	353	3.17 ± 0.28	208/93	3.01 ± 0.39	3.13 ± 0.28	<0.001	1.000	<0.001
Laminar thickness (mm)	353	6.07 ± 1.00	208/93	5.85 ± 1.00	5.89 ± 0.88	0.011	0.450	1.000
Laminar angle (°)	353	49.41 ± 2.93	208/93	49.87 ± 5.15	48.49 ± 4.45	0.533	0.028	0.002
Laminar height (cm)	351	1.25 ± 0.13	121/88	1.19 ± 0.16	1.17 ± 0.12	0.001	<0.001	0.867
Laminar HU values	353	255.55 ± 99.49	208/93	210.17 ± 99.39	218.59 ± 118.73	<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.