

The effect of cervical spondylosis on heterotopic ossification after cervical disc replacement

Objective: Heterotopic ossification (HO) is an intractable issue after cervical disc replacement (CDR) that may decrease the segmental mobility and even develop to arthrodesis. This study aimed to identify factors in preoperative cervical spondylosis that affect the HO formation after surgery and explore the impacts of preoperative degeneration on the occurrence of HO in different locations.

Methods: This was a retrospective study of patients who underwent CDR in our center. The degree of preoperative cervical spondylosis was evaluated radiologically, including the intervertebral disc, uncovertebral joints, facet joints and ligaments. The effects of cervical spondylosis on the HO formation after CDR were analyzed according to the location of HO. Multivariate logistic regression was performed to identify the independent factors.

Results: 149 patients with a total of 196 arthroplasty segments were involved in this study. According to the univariate analysis, the significant factors for posterior HO after CDR included the disc height loss, anterior osteophytes, preoperative uncovertebral joint osteophytes and facet joint degeneration. Multivariate analysis identified disc height loss was the only independent factor for posterior HO formation ($P=0.009$). No significant degenerative factors related to the formation of anterior HO were found neither in univariate analysis nor in multivariate logistic regression.

Conclusion: Preoperative cervical spondylosis predominantly affected the HO formation in the posterior disc space after CDR. In the multiple elements of

preoperative cervical spondylosis, the disc height loss was an independent risk factor for posterior HO formation.

Table 2. Univariate analysis of heterotopic ossification of each segment depending on the location at last follow-up.

	AHO		<i>p</i>	PHO		<i>p</i>
	(-) n=151	(+) n=45		(-) n=114	(+) n=82	
Age	43.93±8.34	42.16±7.68	0.203	42.76±8.20	44.59±8.14	0.236
Sex			0.301			0.908
Male	64	23		51	36	
Female	87	22		63	46	
Follow-up (months)	47.84±21.62	54.82±29.69	0.498	47.48±20.53	52.17±27.64	0.882
Level distribution			0.384			0.309
C3/4	9	3		8	4	
C4/5	35	7		20	22	
C5/6	90	26		68	48	
C6/7	17	9		18	8	
Mean HL score	0.54	0.49	0.718	0.39	0.71	0.003*
Mean AO score	0.79	0.96	0.256	0.68	1.04	0.006*
Mean ES score	0.20	0.22	0.687	0.17	0.26	0.196
Pre-op UJ osteophyte			0.575			0.045*
Yes	81 (53.6%)	22 (48.9%)		53 (46.5%)	50 (61.0%)	
No	70 (46.4%)	23 (51.1%)		61 (53.5%)	32 (39.0%)	
Facet joint degeneration			0.720			0.035*
1	117 (77.5%)	36 (80.0%)		95 (83.3%)	58 (70.7%)	
2	34 (22.5%)	9 (20.0%)		19 (16.7%)	24 (29.3%)	
OALL	26 (17.2%)	10 (22.2%)	0.447	21 (18.4%)	15 (18.3%)	0.982
Pre-op LN ossification	28 (18.5%)	4 (8.9%)	0.124	14 (12.3%)	18 (22.0%)	0.071
Progression of LN	13 (8.6%)	4 (8.9%)	1.000	8 (7.0%)	9 (11.0%)	0.331
ASD	32 (21.2%)	12 (26.7%)	0.440	17 (14.9%)	27 (32.9%)	0.003*

AHO, anterior heterotopic ossification; PHO, posterior heterotopic ossification; IVD, intervertebral disc; HL, height loss; AO, anterior osteophyte; ES, endplate sclerosis; UJ, uncovertebral joint; OALL, ossification of anterior longitudinal ligament; LN, ligamentum nuchae; post-op, values at 1 week after surgery; ROM, range of motion; ASD, adjacent segment degeneration.

Bold values indicate these values would be included in multivariable logistic regression analysis.

* Significant difference between groups.