

**Table S1** Comparison of the lymphadenectomy quality between conventional MIE and RAMIE during four learning phases

Characteristics	Conventional MIE	Phase 1	P value	Phase 2	P value	Phase 3	P value	Phase 4	P value
Age	61.12±8.37	62.17±7.08	0.604	60.09±6.42	0.609	63.09±8.74	0.312	61.65±8.03	0.801
BMI(kg/m <sup>2</sup> )	22.46±3.57	23.19±2.90	0.394	22.80±2.53	0.682	22.88±4.81	0.647	23.60±3.32	0.199
Female/male	15/34	4/19	0.269	3/19	0.152	6/26	0.234	3/20	0.148
Diabetes	4 (8.2%)	1 (4.3%)	1.000	1 (4.5%)	1.000	2 (6.3%)	1.000	1 (4.3%)	1.000
hypertension	9 (18.4%)	6 (26.1%)	0.452	5 (22.7%)	0.669	11 (34.4%)	0.102	4 (17.4%)	1.000
Tumor location			0.133		0.897		0.182		0.299
Upper	4 (8.2%)	5 (21.7%)		2 (9.1%)		6 (18.8%)		0 (0.0%)	
Middle and Lower	45 (91.8%)	18 (78.3%)		20 (90.9%)		26 (81.3%)		23 (100.0%)	
Surgical approach			0.007		0.363		0.070		0.003
Ivor Lewis	12 (24.5%)	0 (0.0%)		3 (13.6%)		14 (43.8%)		14 (60.9%)	
McKeown	37 (75.5%)	23 (100%)		19 (86.4%)		18 (56.3%)		9 (39.1%)	
Histology			1.000		1.000		0.471		0.673
SCC	45 (91.8%)	21 (91.3%)		20 (90.9%)		27 (84.4%)		20 (87.0%)	
Other	4 (8.2%)	2 (8.7%)		2 (9.1%)		5 (15.6%)		3 (13.0%)	
RLN-LN	2.24±2.33	2.00±2.15	0.672	2.77±2.22	0.374	1.81±2.18	0.405	2.22±2.70	0.965
Thoracic LNs	9.96±5.20	8.22±3.24	0.088	13.05±5.64	0.027	8.66±3.61	0.221	10.61±5.28	0.625
Abdomen LNs	7.86±5.48	10.61±8.34	0.159	10.86±6.24	0.044	10.06±6.83	0.113	11.35±6.23	0.019
Total LN	17.86±7.49	18.83±9.13	0.635	23.91±7.10	0.002	18.72±8.25	0.628	21.96±7.85	0.036
T stage			0.459		0.878		0.631		0.459
T0-T2	21 (42.9%)	12 (52.2%)		9 (40.9%)		12 (37.5%)		12 (52.2%)	
T3-T4a	28 (57.1%)	11 (47.8%)		13 (59.1%)		20 (62.5%)		11 (47.8%)	
N stage			1.000		1.000		0.423		0.897
N0-N1	39 (80.0%)	19 (82.6%)		18 (81.8%)		23 (71.9%)		18 (78.3%)	
N2-N3	10 (20.0%)	4 (17.4%)		4 (18.2%)		9 (28.1%)		5 (21.7%)	
TNM Stage			0.692		0.838		0.722		0.313
0-II	28 (57.1%)	12 (52.2%)		12 (54.5%)		17 (53.1%)		16 (70.0%)	
III-IVa	21 (42.9%)	11 (47.8%)		10 (45.5%)		15 (46.9%)		7 (30.0%)	

Note: BMI= body mass index, SCC= squamous cell carcinoma, LN= lymph node, MIE= minimal invasive esophagectomy, RAMIE= robot-assisted minimal invasive esophagectomy, RLN-LN= recurrent laryngeal nerve lymph node