

**TABLE 2. Summary of published studies on resection for thymic malignancy by surgical approach**

Approach	Authors [Ref]	Study period	No. of patients	Masaoka-Koga stage I/II	Masaoka-Koga stage III/IVa	Myasthenia Gravis	Mean tumor size, cm	Mean procedure time, minutes	Conversion to open procedure	Positive margin	Mean LOS, days	Thymoma recurrence	Disease-specific survival, %	Overall survival, %	Mean follow-up, months
Sternotomy	Pennathur et al <sup>1</sup>	1996-2008	22	22 (100%)	0	4 (18.1%)	5.8	n/a	----	0	6.2	1 (4.5%)	n/a	88	58*
	Jurado et al <sup>2</sup>	2000-2011	62	57 (92%)	5 (8%)	n/a	6.5*	130*	----	5 (8%)	5*	5 (8%)	n/a	n/a	81*
	Ye et al <sup>3</sup>	2008-2012	137	137 (100%)	0	0	3.4	216	----	0	12.4	1 (0.7%)	100	100	42*
	Liu et al <sup>4</sup>	1991-2010	44	44 (100%)	0	14 (31.8%)	6.1	150	----	0	9.1	1 (2.3%)	97.7	90.9	69.7
	Tagawa et al <sup>5</sup>	1995-2007	12	11 (91.7%)	1 (8.3%)	8 (66.7%)	3.8	228	----	0	n/a	0	100	100	102
	VATS														
VATS	Pennathur et al <sup>1</sup>	1996-2008	18	18 (100%)	0	7 (38.9%)	3.5	n/a	0	1 (5.6%)	2.9	0	100	100	27*
	Jurado et al <sup>2</sup>	2000-2011	10	10 (100%)	0	n/a	4.5*	226*	0	0	4*	0	n/a	n/a	24.2*
	Ye et al <sup>3</sup>	2008-2012	125	125 (100%)	0	0	3.2	171	4 (3.2%)	0	7.3	1 (0.8%)	100	100	41*
	Liu et al <sup>4</sup>	1991-2010	76	76 (100%)	0	35 (46.1%)	4.6	142	1 (1.3%)	0	7.1	2 (2.6%)	100	97.4	61.9
	Tagawa et al <sup>5</sup>	1995-2007	15	15 (100%)	0	1 (6.7%)	3.6	250	0	0	n/a	1 (6.7%)	93.3	93.3	109
	Agasthian et al <sup>6</sup>	1998-2007	119	50 (42%)	8 (6.7%)	93 (78.1%)	5	150	0	0	5	2 (3.4%)	100	100	58.8
Extended Transcervical															
	de Perrot et al <sup>7</sup>	1991-2000	120	5 (4.2%)	0	120 (100%)	2*	n/a	23 (19%)	n/a	1.9	0	100	100	97*
	Shrager et al <sup>8</sup>	1992-2004	151	13 (8.3%)	0	151 (100%)	n/a	97	11 (6.7%)	n/a	1.1	0	n/a	98.7	53
Robotic															
	Marulli et al <sup>9</sup>	2002-2011	79	79 (100%)	0	45 (57%)	3.7	165	1 (1.3%)	0	4.4	1 (1.3%)	97	90	51.7
	Mussi et al <sup>10</sup>	2002-2011	14	13 (93%)	1 (7%)	1 (7%)	3.3	139	2 (14.3%)	0	4	0	100	100	14.5*
	Keijzers et al <sup>11</sup>	2004-2012	37	33 (89.2%)	4 (10.8%)	28 (75.7%)	5.1	149	5 (13.5%)	4 (10.8%)	3*	1 (2.7%)	100	100	36*
	Ye et al <sup>12</sup>	2009-2012	21	21 (100%)	0	0	2.9	96	0	0	3.7	0	100	100	17.5

LOS length of stay, VATS video-assisted thoracoscopy, n/a data not available

\* Denotes median rather than mean

References:

- Pennathur A, Qureshi I, Schuchert MJ, Dhupar R, Ferson PF, Gooding WE, Christie NA, Gilbert S, Shende M, Awais O, Greenberger JS, Landreneau RJ, Luketich JD. Comparison of surgical techniques for early-stage thymoma: feasibility of minimally invasive thymectomy and comparison with open resection. *The Journal of thoracic surgery* 2012; 94: 974-981; discussion 981-972.
- Jurado J, Javidfar J, Newmark A, Lavelle M, Bacchetta M, Gorenstein L, D'Ovidio F, Ginsburg ME, Sonett JR. Minimally invasive thymectomy and open thymectomy: outcome analysis of 263 patients. *The Annals of thoracic surgery* 2012; 94: 974-981; discussion 981-972.
- Ye B, Tantai JC, Ge XX, Li W, Feng J, Cheng M, Shi JX, Zhao H. Surgical techniques for early-stage thymoma: Video-assisted thoracoscopic thymectomy versus transsternal thymectomy. *The Journal of thoracic and cardiovascular surgery* 2013.
- Liu TJ, Lin MW, Hsieh MS, Kao MW, Chen KC, Chang CC, Kuo SW, Huang PM, Hsu HH, Chen JS, Lai HS, Lee JM. Video-assisted thoracoscopic surgical thymectomy to treat early thymoma: a comparison with the conventional transsternal approach. *Annals of surgical oncology* 2014; 21: 322-328.
- Tagawa T, Yamasaki N, Tsuchiya T, Miyazaki T, Morino S, Akamine S, Nagayasu T. Thoracoscopic versus transsternal resection for early stage thymoma: long-term outcomes. *Surgery today* 2014.
- Agasthian T, Lin SJ. Clinical outcome of video-assisted thymectomy for myasthenia gravis and thymoma. *Asian cardiovascular & thoracic annals* 2010; 18: 234-239.
- de Perrot M, Bril V, McRae K, Keshavjee S. Impact of minimally invasive trans-cervical thymectomy on outcome in patients with myasthenia gravis. *European journal of cardio-thoracic surgery : official journal of the European Association for Cardio-thoracic Surgery* 2003; 24: 677-683.
- Shrager JB, Nathan D, Brinster CJ, Yousuf O, Spence A, Chen Z, Kaiser LR. Outcomes after 151 extended transcervical thymectomies for myasthenia gravis. *The Annals of thoracic surgery* 2006; 82: 1863-1869.
- Marulli G, Rea F, Melfi F, Schmid TA, Ismail M, Fanucchi O, Augustin F, Swierzy M, Di Chiara F, Mussi A, Rueckert JC. Robot-aided thoracoscopic thymectomy for early-stage thymoma: a multicenter European study. *The Journal of thoracic and cardiovascular surgery* 2012; 144: 1125-1130.
- Mussi A, Fanucchi O, Davini F, Lucchi M, Picchi A, Ambrogi MC, Melfi F. Robotic extended thymectomy for early-stage thymomas. *European journal of cardio-thoracic surgery : official journal of the European Association for Cardio-thoracic Surgery* 2012; 41: e43-46; discussion e47.
- Keijzers M, Dingemans AM, Blaauwgeers H, van Suylen RJ, Hochstenbag M, van Garsse L, Accord R, de Baets M, Maessen J. 8 Years' experience with robotic thymectomy for thymomas. *Surgical endoscopy* 2013.
- Ye B, Tantai JC, Li W, Ge XX, Feng J, Cheng M, Zhao H. Video-assisted thoracoscopic surgery versus robotic-assisted thoracoscopic surgery in the surgical treatment of Masaoka stage I thymoma. *World journal of surgical oncology* 2013; 11: 157.