Background Previous studies have shown that anterior spinal fusion significantly decreased FVC% and FEV1% values after AIS surgery. Few studies investigate the effects of anterior thoracoscopic VBT surgery on pulmonary function. Purpose The aim of this study was to compare pulmonary function test results before and after anterior thoracoscopic VBT surgery. Methods Data were collected preoperatively, at 6-weeks, 1-year and yearly after 2 years follow-up. All-thoracoscopic technique was used to approach thoracic vertebrae, while retroperitoneal flank incision was used to access lumbar vertebrae. Demographic, clinical, radiographic data and complications were analyzed. Curve sizes at each follow-up were compared using repeated measures ANOVA. Preoperative, 1-year, 2-3 years and 4-5 years postoperative FVC% and FEV1% were compared using mixed models. Results 74 consecutive patients (68F, 6M; 12.7±1.7 years) with a mean follow-up of 39 (24-92) months were included. 77% were Lenke 1 and there were 2, 2, 10 and 3 patients with Lenke 2, 3, 5 and 6 curve patterns, respectively. Preoperatively, median Sanders was 3 (1-7) and median Risser was 0 (0-5)). A mean of 8 (5-11) levels were tethered. Patients grew 6 cm on average; height measurements showing significant increase ($p<0.001$). 82% of the patients reached skeletal maturity at final follow-up. The mean preoperative MT curve magnitude of 49.6º±11.3º was corrected to 24.9º±7.6º at first erect radiographs, which was modulated to 19.5º±12.9º during follow-up, displaying a significant decrease. A total of 6 (8.1%) patients experienced pulmonary complications (2 ipsilateral and 1 contralateral atelectasis, 1 lobar atelectasis, 1 pleural effusion and 1 chylothorax). Thoracic VBT resulted in improved PFT at 1 year ($p=0.015$). Further improvements were observed between 1 to 2-3 years, and 2-3 to 4-5 years follow-up for FEV1 and FVC, respectively ($p=0.012$ and $p=0.024$). Pulmonary function after thoracolumbar and double-curve VBT; however, were similar between preoperative and 1-year and 2-3 years postoperative follow-up (Figure). Conclusion Thoracic-only VBT surgery resulted in improved pulmonary function at 1-year, which further improved at 2-3 years and/or 4-5 years follow-up. Thoracolumbar and double-curve VBT surgeries did not cause worsening nor improvement in pulmonary function 1-year and 2-3 years after surgery.

	Pre-Operative			1-year Postoperative				2-3 years Postoperative				4-5 years Postoperative			
Thoracic VBT	n	Mean ± SD	Median (Min-Max)	n	Mean ± SD	Median (Min-Max)	*p*	n	Mean ± SD	Median (Min-Max)	*p*	n	Mean ± SD	Median (Min-Max)	*p*
FVC% Predicted	50	81.5 ± 13.4	83 (53 –113)	45	86.2 ± 12.6	85 (65 –124)	**0.015***	31	91.2 ± 12.0	91 (67 – 115)	0.092	17	97.1 ± 12.0	100 (73 – 117)	**0.024***
FEV1% Predicted	50	80.9 ± 11.8	81 (60 –110)	45	88.5 ± 13.0	86 (68 – 143)	**0.001***	31	92.1 ± 11.7	91 (70 – 118)	**0.012***	17	96.2 ± 10.1	95 (77 – 111)	1.000

	Pre-Operative			1-year Postoperative				2-3 years Postoperative			
Thoracolumbar VBT	n	Mean ± SD	Median (Min-Max)	n	Mean ± SD	Median (Min-Max)	*p*	n	Mean ± SD	Median (Min-Max)	*p*
FVC% Predicted	10	91.4 ± 18.1	91.5 (57 – 117)	8	89.4 ± 18.5	85.5 (60 – 116)	1.000	7	90.3 ± 15.8	86 (72 – 122)	0.481
FEV1% Predicted	10	93.3 ± 19.4	91 (66 – 130)	8	92.0 ± 17.2	86.5 (67 – 119)	1.000	7	93.3 ± 14.4	86 (82 – 120)	1.000

	Pre-Operative			1-year Postoperative				2-3 years Postoperative			
Double-Curve VBT	n	Mean ± SD	Median (Min-Max)	n	Mean ± SD	Median (Min-Max)	*p*	n	Mean ± SD	Median (Min-Max)	*p*
FVC% Predicted	13	83.4 ±10.5	85 (61 – 97)	12	81.9 ± 11.9	81.5 (59 – 98)	1.000	9	90.7 ± 14.6	90 (64 – 110)	0.236
FEV1% Predicted	13	83.1 ± 12.5	82 (59 –107)	12	84.9 ± 16.5	87 (56 –105)	1.000	9	93.7 ± 16.7	94 (71 – 114)	0.379