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Introduction

Pulmonary pleomorphic carcinoma is a rare and aggressive subtype of non-small cell lung cancer, and evidence regarding long-term pulmonary rehabilitation in very elderly patients remains limited. This case study aimed to investigate the long-term functional and physiological outcomes of outpatient-based pulmonary rehabilitation in a very elderly patient following lung cancer surgery and adjuvant chemotherapy.

Methods

This retrospective single-case study included a 75-year-old patient diagnosed with pulmonary pleomorphic carcinoma (pT3N0, stage IIB) who underwent left upper lobectomy followed by adjuvant chemotherapy. Outpatient-based pulmonary rehabilitation was initiated approximately one month postoperatively and continued for 32 months, followed by home-based self-management with long-term follow-up until age 80. Clinical outcomes included pulmonary function (FVC, FEV₁), respiratory muscle strength (maximal inspiratory pressure [MIP] and maximal expiratory pressure [MEP]), functional exercise capacity assessed by the six-minute walk test (6MWT), and cardiopulmonary fitness evaluated by cardiopulmonary exercise testing (VO₂peak).

Results

Functional exercise capacity improved substantially during the rehabilitation period, with the 6MWT distance increasing from 375 m postoperatively to a peak of 571 m and remaining above 500 m at final follow-up. Respiratory muscle strength showed significant improvement during supervised rehabilitation, with MIP increasing from 49 cmH₂O to 90 cmH₂O and MEP from 66 cmH₂O to over 100 cmH₂O, followed by mild decline after discontinuation but maintained at functional levels at age 80. VO₂peak improved during long-term follow-up, reaching approximately 21.75 mL/kg/min (83–89% of predicted values). Pulmonary function decreased after surgery but remained stable within the expected predicted postoperative range throughout follow-up.

	Date of evaluation	Age (years)	Weight (kg)	FVC (%)	FEV ₁ (%)	FEV ₁ /FVC (%)	MIP (cmH ₂ O)	MEP (cmH ₂ O)	6MWT (m)
Diagnosis	2018.03.23	75							
				Lung cancer (pleomorphic carcinoma, T3N0, stage IIB)					
				HT / DM / Hepatitis / Tb -/-/-/-					
Pre-OP	2018.03.26	75	52.0	82	82	69	-	-	-
OP	2018.04.11	75		Left upper lobe lobectomy, wedge resection of Left lower lobe					
POD 9 (PRTC)	2018.04.19	75	50.8	-	-	-	49	66	375
POD 34 (PRTC)	2018.05.14	75	50.8	48.98	61.33	86.31	66	84	443
CTx	2018.05.08	75		Adjuvant vinorelbine / cisplatin					
POD 56 (PRTC)	2018.06.05	75	52.5	51.73	63.4	84.24	83	87	465
POD 133 (PRTC)	2018.08.21	75	55.5	57.66	71.93	84.21	61	100	481
POD 231 (PRTC)	2018.11.27	75	58.6	56.67	72.43	85.2	79	108	540
POD 308 (PRTC)	2019.02.12	76	58.9	58.52	70.32	80.25	85	94	534
POD 476 (PRTC)	2019.07.30	76	59.3	54.95	64.68	78.53	90	102	536
POD 609 (PRTC)	2019.12.10	77	59.6	60.85	77.87	84.16	80	93	571
POD 882 (PRTC)	2020.09.08	78	56.6	56.08	70.3	82.11	81	97	521
POD 1770 (HPR)	2023.02.13	80	56.0	-	-	-	65	72	-

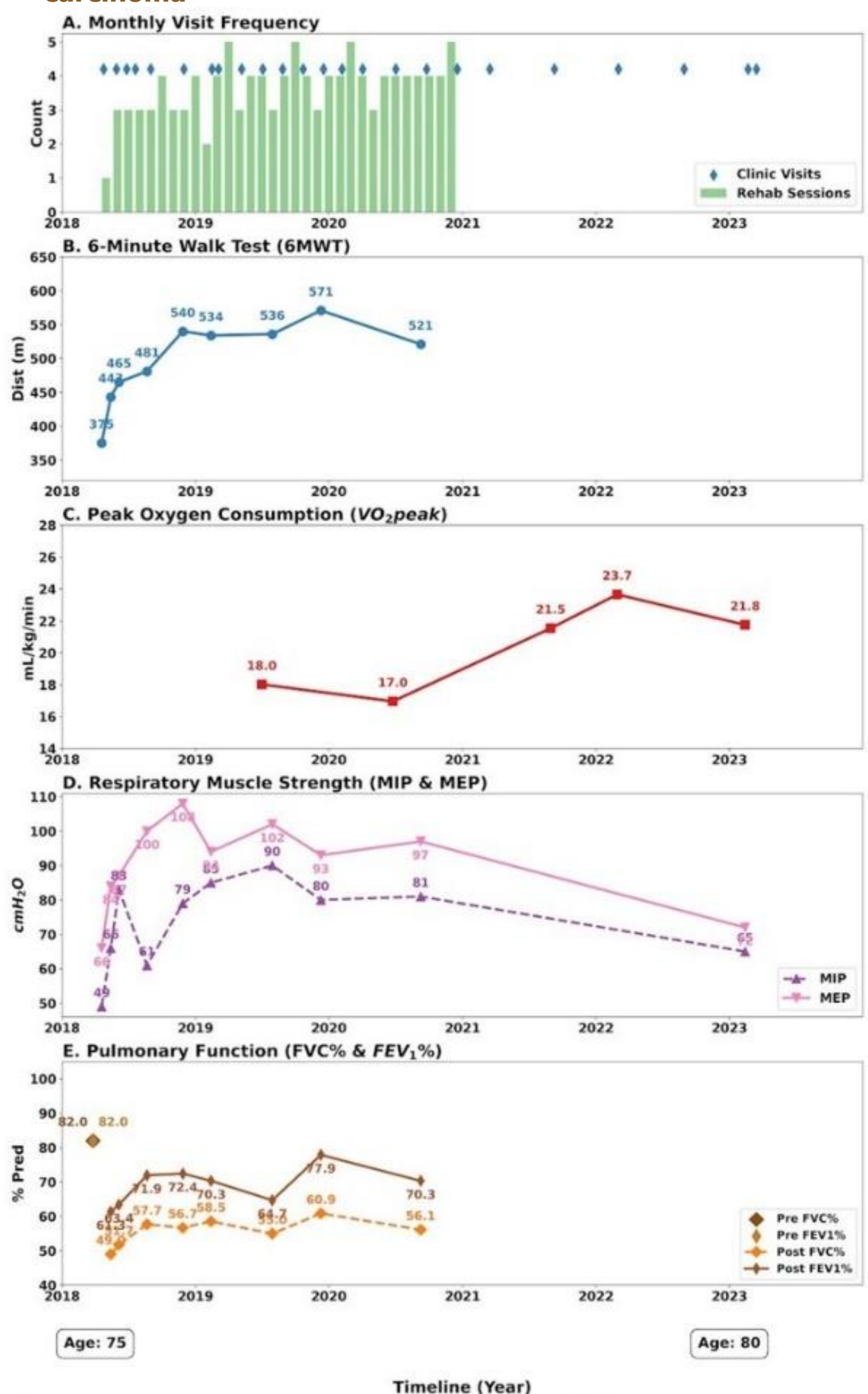
6MWT, six-minute walk test; MIP, maximal inspiratory pressure; MEP, maximal expiratory pressure; HT, hypertension; DM, diabetes mellitus; TB, tuberculosis; POD, post-operative day; PRTC, pulmonary rehabilitation treatment center; CTx, chemotherapy; HPR, home pulmonary rehabilitation

Fig 1. Longitudinal changes in functional and physiological parameters over a 5-year follow-up in an elderly patient with pulmonary pleomorphic carcinoma

Conclusion

Long-term outpatient pulmonary rehabilitation combined with sustained physical activity may contribute to maintaining functional capacity, respiratory muscle strength, and cardiopulmonary fitness in very elderly patients with pulmonary pleomorphic carcinoma. This case highlights the potential feasibility and clinical relevance of prolonged rehabilitation strategies in high-risk elderly lung cancer populations.

Table 1. Longitudinal changes in physical function and respiratory outcomes in a patient with pleomorphic lung carcinoma



Clinical course of a patient with pulmonary pleomorphic carcinoma followed from age 75 to 80.

(A) Monthly visit frequency of outpatient pulmonary rehabilitation sessions (green bars) and clinic visits (blue diamonds), demonstrating sustained adherence during the rehabilitation period.

(B) Six-minute walk test (6MWT) distance, showing a marked improvement following rehabilitation and subsequent maintenance over time.

(C) Peak oxygen consumption (VO₂peak) assessed by cardiopulmonary exercise testing (CPET), indicating preserved cardiorespiratory fitness during long-term follow-up.

(D) Respiratory muscle strength, assessed by maximal inspiratory pressure (MIP) and maximal expiratory pressure (MEP).

(E) Pulmonary function parameters, expressed as predicted forced vital capacity (FVC%) and forced expiratory volume in 1 second (FEV₁%). Preoperative values obtained in March 2018 (82% for both) are shown as independent data points to contrast with postoperative functional changes.

CPET, cardiopulmonary exercise testing; FVC, forced vital capacity; FEV₁, forced expiratory volume in 1 second; MIP, maximal inspiratory pressure; MEP, maximal expiratory pressure.