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CURRENT TREATMENT PLAN FOR PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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BACKGROUND

- Chronic obstructive pulmonary disease (COPD) is a progressive, obstructive, and debilitating respiratory disease that brings huge impact to the society medically and financially.
- Patients with COPD suffer with significant weaking of patients' exercise capacity, which lead to socially isolation related mental problems that contribute to the decrease of quality of life.
- Pulmonary rehabilitation (PR) has shown positive results of improving patients' forced expiratory volume in 1 second (FEV1), exercise capacity, and mental health.
- The forced expiratory volume in 1 second (FEV1) is often used to predict the mortality rate for COPD patients.

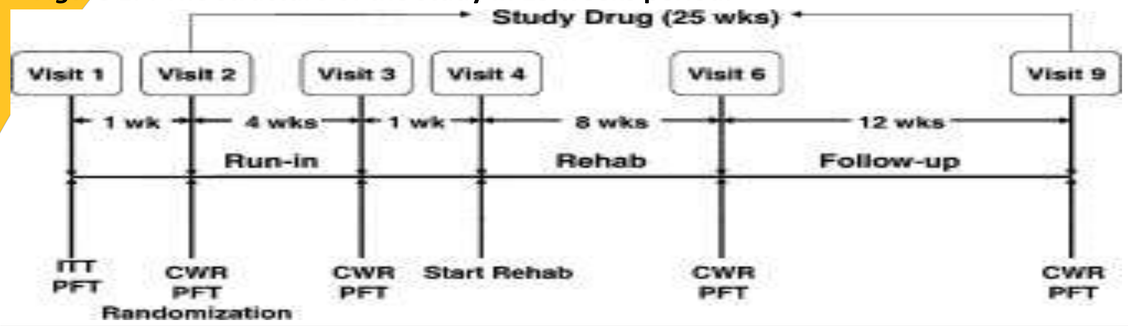
PURPOSE

Under different conditions, the studies exanimated the benefits COPD patients can receive from PR treatments including measuring exercise capacity, FEV-1 volume, etc.

PR TREATMENT COMBINED WITH TIOTROPIUM

- The study is a randomized, double-blind, placebo-controlled trail with 93 participants(Casaburi, et al. 2005).
- Patients from both side of the experiment groups participate an 8-week PR treatment (treadmill training three times a week, at least 30 minutes in each treatment session) (Casaburi, et al. 2005).
- The result of the test is based on patients' endurance performance on the treadmill test. Three tests are conducted 5 weeks prior to, 8 weeks during, and 12 weeks following PR treatment.
- The result of this study shows that PR treatment has significant benefits for patients with COPD, the combination treatment between Tiotropium and PR treatment have continuous benefits even 12 weeks after the treatment (Casaburi, et al. 2005).

Figure 1. **: The structure of the study in 25 weeks period.**



Variables	Time, min: Tiotropium (n = 47)	Time, min: Placebo (n = 44)	Difference†: Mean (SE)	Difference†: p Value	Difference†: 95% CI
Before PR (day 29)	12.14 (0.83)	10.50 (0.86)	1.65 (1.22)	0.183	− 0.79–4.09
After PR (day 92)	21.86 (1.58)	16.51 (1.64)	5.35 (2.34)	0.025	0.69–10.00
12 wk after PR (day 176)	22.36 (1.84)	15.76 (1.91)	6.60 (2.72)	0.018	1.18–12.02

*Data are presented as mean (SE). Mean adjusted baseline was 9.72 min.
†Analysis of covariance.

Table 1. Patients' endurance performance on the treadmill test before and after the PR treatment from both control group and experimental group.

PR TREATMENT AND EXERCISE CAPACITY

- This study is a controlled hospital based, outpatient RP trail in a 12-week period with 26 patients.
- All the patients have normal exercise capacity, the baseline and post PR status were evaluated by spirometry, the St George's Respiratory Questionnaire, cardiopulmonary exercise test, respiratory muscle strength, and dyspnea scores (Lan, et al. 2013).
- The mean FEV1 in the subjects was 1.29 ± 0.47 L/min, 64.8 ± 23.0% of predicted. After PR there was significant improvement in maximal oxygen uptake and work rate (Lan, et al. 2013).
- Patients' exercise capacity, respiratory muscle strength, and mental health scores have shown improvement as well (Lan, et al. 2013).

	Before Pulmonary Rehabilitation	After Pulmonary Rehabilitation	Mean Difference	*P*
FEV_1/FVC, %	59.4 ± 14.1	61.5 ± 15.0	2.1	.34
FEV_1, L	1.29 ± 0.47	1.33 ± 0.46	0.04	.46
FEV_1, % predicted	64.8 ± 23.0	66.7 ± 22.3	2.0	.42
FVC, L	2.24 ± 0.79	2.21 ± 0.66	−0.03	.75
FVC, % predicted	88.3 ± 34.5	87.7 ± 32.0	−0.6	.87
P_{Imax}, cm H_2O	68.1 ± 25.7	75.9 ± 24.0	7.8	.02
P_{Imax}, % of predicted	73.6 ± 25.6	82.5 ± 22.2	8.9	.02
P_{Emax}, cm H_2O	109.4 ± 30.5	121.4 ± 37.3	12.0	.03
P_{Emax}, % of predicted	65.2 ± 20.7	71.5 ± 20.4	6.3	.04
SGRQ scores				
Total	39.8 ± 16.3	28.6 ± 16.0	−12.4	< .001
Symptoms	47.8 ± 23.9	35.5 ± 25.9	−7.8	.03
Activity	50.6 ± 18.7	42.8 ± 18.2	−12.5	< .001
Impact	31.2 ± 20.1	18.7 ± 15.3	−11.1	< .001

Values are mean ± SD.
P_{Imax} = maximum inspiratory pressure
P_{Emax} = maximum expiratory pressure
SGRQ = St George's Respiratory Questionnaire

Table 2. Patients' FEV-1 volume change before and after the PR treatment with the mean difference and standard deviation.

	Before Pulmonary Rehabilitation	After Pulmonary Rehabilitation	Mean Difference	*P*
Work rate, watts	82.1 ± 30.4	90.3 ± 32.7	8.2	.001
Work rate, % predicted	97.8 ± 15.9	108.6 ± 18.8	10.8	.003
$\dot{V}_{O_2}$, mL/min	1,232.6 ± 327.9	1,334.0 ± 359.3	101.3	.001
$\dot{V}_{O_2}$, % predicted	91.6 ± 8.2	100.0 ± 12.6	7.9	.001
$\dot{V}_E$, L/min	40.2 ± 13.2	39.3 ± 12.4	−0.9	.52
V_T, mL	1,152.8 ± 394.6	1,153.4 ± 406.7	0.6	.99
$\dot{V}_E/\dot{V}_{CO_2}$	33.6 ± 7.5	32.3 ± 7.8	−1.4	.16
Heart rate, beats/min	134.5 ± 14.9	137.4 ± 19.9	3.0	.36
Mean blood pressure, mm Hg	109.6 ± 15.7	110.3 ± 15.1	0.7	.72
Oxygen pulse, mL/beat	9.2 ± 2.5	9.8 ± 2.7	0.6	.02
S_{pO_2}, %	93.9 ± 3.1	94.0 ± 2.9	0.1	.79
P_{ETCO_2}, mm Hg	39.8 ± 8.3	41.2 ± 6.8	1.4	.28
Exertional dyspnea score	5.7 ± 1.3	4.8 ± 2.0	−0.9	.01

Values are mean ± SD.
$\dot{V}_{O_2}$ = oxygen uptake
V_T = tidal volume
$\dot{V}_E$ = minute ventilation
$\dot{V}_{CO_2}$ = carbon dioxide clearance
P_{ETCO_2} = end-tidal P_{CO_2}

Table 3. Patients' cardiopulmonary work rate change before and after the PR treatment with the mean difference and standard deviation.

CONCLUSION

- Patients that receive both PR and tiotropium treatment show significant improvement of exercise endurance performance on the treadmill test.
- Both groups show positive results from PR treatment, but the 12-week follow up test result shows the combination treatment has a sustainable benefits for patients' exercise capacity.
- Patients report a higher mental health score in the survey after PR treatment, which indicate that PR treatment also has a positive effective on patients' mental health. Reverse the stress and social isolation that COPD brings to patients.
- These findings demonstrate the importance of PR treatment and the relationship between PR treatment and pharmacologic treatments .
- Considering the significant results of the combination treatment. Doctors nowadays should consider prescribe exercise modality as the primary care option just like other pharmacologic options.

REFERENCES

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