Long-term Observation of Respiratory Function After Unilateral Phrenic Nerve and Multiple Intercostal Nerve Transfer for Avulsed Brachial Plexus Injury

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BACKGROUND

Phrenic nerve transfer (PNT) or multiple intercostal nerve transfer (MIT) alone are reported to have no significant impact on pulmonary function in the short or medium term, but it has rarely been reported whether the combination of PNT-MIT could influence respiratory function in the long term.

OBJECTIVE

Respiratory function was evaluated after PNT and PNT-MIT 7 to 19 years (mean, 10 years) postoperatively.

TABLE 1. Demographic Data of Patients Who Underwent PNT or Combined PNT-MIT Procedures[a,b]

Variables	PNT	PNT-MIT
Number	19	23
Sex		
Male	16	19
Female	3	4
Injured side		
Left	12	14
Right	7	9
Duration of follow-up, y	10.24 ± 2.22	10.80 ± 2.84
Age at operation, y	28.73 ± 17.77	24.46 ± 10.58
Present age, y	38.96 ± 17.31	35.26 ± 10.68
Height, cm	168.05 ± 7.97	169.09 ± 7.83
Weight, kg	63.42 ± 13.37	70.04 ± 12.41

[a]PNT, phrenic nerve transfer; PNT-MIT, phrenic nerve and multiple intercostal nerves transfer.
[b]Data summarized here were presented as frequency for category variables or as mean ± SD for numerical measurements. There were no significant differences between PNT and PNT-MIT groups in numerical measurements of demographic

METHODS

Twenty-three adult patients with brachial plexus avulsion injuries who underwent PNT-MIT were compared with 19 corresponding patients who underwent PNT. Pulmonary function testings, phrenic nerve conduction study, and chest fluoroscopy were performed. In the PNT-MIT group, further investigation was performed on the effect of the number of transferred intercostal nerves and the timing of MIT.

RESULTS

1. In the PNT-MIT group, forced vital capacity, forced expiratory volume in one second, and total lung capacity were 73.69%, 72.04%, and 74.81% of predicted values without significant differences from the PNT group. Diaphragmatic paralysis permanently existed with 1 to 1.5 intercostal spaces (ICSs) elevation and near 1 ICS reduced excursion.

2. There was no statistical difference between the PNT and PNT-MIT groups. (Figure 1)

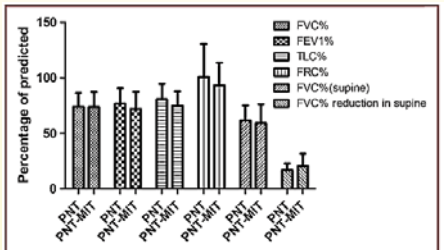

FIGURE 1. *Comparison of pulmonary function between patients who underwent phrenic nerve transfer (PNT) or combined phrenic nerve and multiple intercostal nerve transfer (PNT-MIT) procedures. No significant differences were found between 2 groups. FVC, forced vital capacity; FEV1, forced expiratory volume in one second; TLC, total lung capacity; FRC, functional residual capacity.*

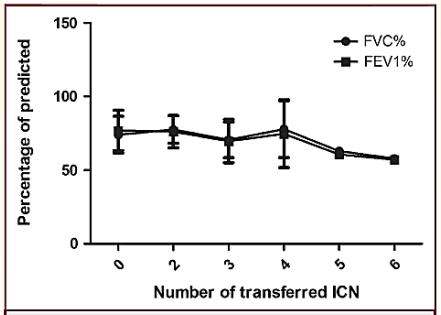

FIGURE 2. *Data of pulmonary function when PNT was combined with the transfer of 0 to 6 intercostal nerves. When 0, 2, 3, and 4 intercostal nerves were transferred, no significant differences were found. The 2 patients with 5 and 6 intercostal nerves transferred were listed for observation but not involved in the statistics. PNT, phrenic nerve transfer; FVC, forced vital capacity; FEV1, forced expiratory volume in one second; ICN, intercostal nerve.*

3. Furthermore, 3 and 4 intercostal nerves transferred resulted in no further decrease in pulmonary function test results than 2 intercostal nerves. (Figure 2)

4. No significant difference was found when PNT and MIT were performed at the same stage or with an interval. (Figure 3)

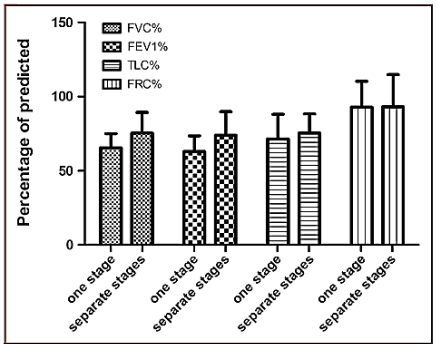

FIGURE 3. *Comparison of pulmonary function between patients with multiple intercostal nerves transfer (MIT) performed at 1 stage or 1 to 2 months delay after phrenic nerve transfer (PNT). Some decrease in FVC%, FVE$_1$%, and TLC% was observed in the one-stage group but was not statistically significant. FVC, forced vital capacity; FEV1, forced expiratory volume in one second; TLC, total lung capacity; FRC, functional residual capacity.*

CONCLUSIONS

PNT-MIT did not result in additional impairment in respiratory function in adult patients compared with PNT alone. It is safe to transfer 2 to 4 intercostal nerves at 1 to 2 months delay after PNT.

-Zheng MX, Xu WD, et al. Neurosurgery. 2012.