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# The Pleural Effusion And Symptom Evaluation (PLEASE) study of breathlessness in patients with a symptomatic pleural effusion

Sanjeevan Muruganandan<sup>1,2,3,15</sup>, Maree Azzopardi<sup>4,15</sup>, Rajesh Thomas<sup>2,3,5</sup>, Deirdre B. Fitzgerald<sup>2,3,5</sup>, Yi Jin Kuok<sup>6</sup>, Hui Min Cheah<sup>2,3</sup>, Catherine A. Read<sup>2,3</sup>, Charley A. Budgeon<sup>7,8</sup>, Peter R. Eastwood<sup>9,10,11</sup>, Susan Jenkins<sup>12,13,14</sup>, Bhajan Singh<sup>9,10,11</sup>, Kevin Murray<sup>8</sup> and Y.C. Gary Lee<sup>2,3,5</sup>

**Affiliations:** <sup>1</sup>Dept of Respiratory Medicine, The Northern Hospital, Melbourne, Australia. <sup>2</sup>Pleural Medicine Unit, Institute for Respiratory Health, Perth, Australia. <sup>3</sup>Centre for Respiratory Health, School of Medicine and Pharmacology, University of Western Australia, Perth, Australia. <sup>4</sup>Dept of Respiratory Medicine, Sunshine Coast University Hospital, Birtinya, Australia. <sup>5</sup>Dept of Respiratory Medicine, Sir Charles Gairdner Hospital, Perth, Australia. <sup>6</sup>Dept of Radiology, Sir Charles Gairdner Hospital, Perth, Australia. <sup>7</sup>Dept of Cardiovascular Sciences, University of Leicester, Leicester, UK. <sup>8</sup>School of Population and Global Health, University of Western Australia, Perth, Australia. <sup>9</sup>West Australian Sleep Disorders Research Institute, Perth, Australia. <sup>10</sup>Centre for Sleep Science, School of Human Sciences, University of Western Australia, Perth, Australia. <sup>11</sup>Pulmonary Physiology and Sleep Medicine, Sir Charles Gairdner Hospital, Perth, Australia. <sup>12</sup>Physiotherapy Unit, Institute for Respiratory Health, Perth, Australia. <sup>13</sup>Physiotherapy Dept, Sir Charles Gairdner Hospital, Perth, Australia. <sup>14</sup>School of Physiotherapy and Exercise Science, Curtin University, Perth, Australia. <sup>15</sup>Joint first authors.

**Correspondence:** Y.C. Gary Lee, School of Medicine, UWA, 533 Harry Perkins Building, QE II Medical Centre, Perth, WA 6009, Australia. E-mail: gary.lee@uwa.edu.au



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The majority of patients improve after pleural fluid drainage. Abnormal diaphragmatic function may be an important contributor to breathlessness in patients with pleural effusion. <http://bit.ly/2SyF8RW>

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## ABSTRACT

**Introduction:** Pathophysiology changes associated with pleural effusion, its drainage and factors governing symptom response are poorly understood. Our objective was to determine: 1) the effect of pleural effusion (and its drainage) on cardiorespiratory, functional and diaphragmatic parameters; and 2) the proportion as well as characteristics of patients with breathlessness relief post-drainage.

**Methods:** Prospectively enrolled patients with symptomatic pleural effusions were assessed at both pre-therapeutic drainage and at 24–36 h post-therapeutic drainage.

**Results:** 145 participants completed pre-drainage and post-drainage tests; 93% had effusions  $\geq 25\%$  of hemithorax. The median volume drained was 1.68 L. Breathlessness scores improved post-drainage (mean visual analogue scale (VAS) score by  $28.0 \pm 24$  mm; dyspnoea-12 (D12) score by  $10.5 \pm 8.8$ ; resting Borg score before 6-min walk test (6-MWT) by  $0.6 \pm 1.7$ ; all  $p < 0.0001$ ). The 6-min walk distance (6-MWD) increased by  $29.7 \pm 73.5$  m,  $p < 0.0001$ . Improvements in vital signs and spirometry were modest (forced expiratory volume in 1 s (FEV<sub>1</sub>) by 0.22 L, 95% CI 0.18–0.27; forced vital capacity (FVC) by 0.30 L, 95% CI 0.24–0.37). The ipsilateral hemi-diaphragm was flattened/everted in 50% of participants pre-drainage and 48% of participants exhibited paradoxical or no diaphragmatic movement. Post-drainage, hemi-diaphragm shape and movement

were normal in 94% and 73% of participants, respectively. Drainage provided meaningful breathlessness relief (VAS score improved  $\geq 14$  mm) in 73% of participants irrespective of whether the lung expanded (mean difference 0.14, 95% CI 10.02–0.29;  $p=0.13$ ). Multivariate analyses found that breathlessness relief was associated with significant breathlessness pre-drainage (odds ratio (OR) 5.83 per standard deviation (SD) decrease), baseline abnormal/paralyzed/paradoxical diaphragm movement (OR 4.37), benign aetiology (OR 3.39), higher pleural pH (OR per SD increase 1.92) and higher serum albumin level (OR per SD increase 1.73).

**Conclusions:** Breathlessness and exercise tolerance improved in most patients with only a small mean improvement in spirometry and no change in oxygenation. Breathlessness improvement was similar in participants with and without trapped lung. Abnormal hemi-diaphragm shape and movement were independently associated with relief of breathlessness post-drainage.