

Electrical Impedance Tomography (EIT) in Adult Critical Care: **A Curated Bibliography**



Electrical impedance tomography (EIT) has become an increasingly valuable tool, particularly for patients who require mechanical ventilation. EIT allows for continuous, real-time, noninvasive monitoring of ventilation-related regional impedance variations, thereby decreasing the need for radiation-based imaging like CT scans. EIT's ability to provide regional insights into lung recruitment, overdistension, and ventilation makes it instrumental in optimizing care for critically ill patients. Key studies utilizing Sentec's EIT System are presented in this bibliography, which investigates its clinical benefits, applications, and future potential in intensive care.

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Select Reviews and Consensus Guidelines on EIT

1. Frerichs, I., Amato, M.B., van Kaam, A.H., et al. Chest electrical impedance tomography examination, data analysis, terminology, clinical use and recommendations: consensus statement of the TRanslational EIT developmeNt stuDy group. *Thorax*. 2017.
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4. Songsangvorn, N., Xu, Y., Lu, C., et al. Electrical impedance tomography-guided positive end-expiratory pressure titration in ARDS: a systematic review and meta-analysis. *Intensive Care Med*. 2024.
5. Jimenez, J.V., Weirauch, A.J., Culter, C.A., Choi, P.J., Hyzy, R.C. Electrical Impedance Tomography in Acute Respiratory Distress Syndrome Management. *Crit Care Med*. 2022.
6. Yu, M., Deng, Y., Cha, J., et al. PEEP titration by EIT strategies for patients with ARDS: A systematic review and meta-analysis. *Med Intensiva (Engl Ed)*. 2023.
7. Walsh, B.K., Smallwood, C.D. Electrical Impedance Tomography During Mechanical Ventilation. *Respir Care*. 2016.
8. Bachmann, C.M., Morais, C., Bugedo, G., et al. Electrical impedance tomography in acute respiratory distress syndrome. *Crit Care*. 2018.
9. Frerichs, I. Electrical impedance tomography (EIT) in applications related to lung and ventilation: a review of experimental and clinical activities. *Physiol Meas*. 2000.

10. Heines, SJH, Becher, T.H., Horst, ICC van der, Bergmans, DCJJ. Clinical Applicability of Electrical Impedance Tomography in Patient-Tailored Ventilation: A Narrative Review. *Tomography*. 2023.
11. Franchineau, G., Jonkman, A.H., Piquilloud, L., et al. Electrical Impedance Tomography to Monitor Hypoxemic Respiratory Failure. *Am J Respir Crit Care Med*. 2023.

Note: The studies in this section provide a broad overview of EIT and contain contributions from across the field. These publications do not focus solely on the Sentec LuMon™ System.

Validation Studies

1. Karagiannidis, C., Waldmann, A.D., Róka, P.L., et al. Regional expiratory time constants in severe respiratory failure estimated by electrical impedance tomography: a feasibility study. *Crit Care*. 2018.
2. Katayama, S., Tonai, K., Nakamura, K., et al. Can Four-Dimensional Computed Tomography Assess Dynamic Changes in Lung Volumes in Mechanically Ventilated Patients? *Am J Respir Crit Care Med*. 2024.
3. Spadaro, S., Mauri, T., Böhm, S.H., et al. Variation of poorly ventilated lung units (silent spaces) measured by electrical impedance tomography to dynamically assess recruitment. *Crit Care*. 2018.
4. Wisse, J.J., Flinsenbergh, MJW, Jonkman, A.H., Goos, T.G., Gommers, D. Respiratory rate monitoring in ICU patients and healthy volunteers using electrical impedance tomography: a validation study. *Physiol Meas*. 2024.
5. Katayama, S., Tonai, K., Nakamura, K., et al. Regional ventilation dynamics of electrical impedance tomography validated with four-dimensional computed tomography: single-center, prospective, observational study. *Crit Care*. 2024.

Personalization of Ventilation

1. Scaramuzzo, G., Spadaro, S., Dalla Corte, F., et al. Personalized Positive End-Expiratory Pressure in Acute Respiratory Distress Syndrome: Comparison Between Optimal Distribution of Regional Ventilation and Positive Transpulmonary Pressure. *Crit Care Med*. 2020.
2. Spadaro, S., Mauri, T., Böhm, S.H., et al. Variation of poorly ventilated lung units (silent spaces) measured by electrical impedance tomography to dynamically assess recruitment. *Crit Care*. 2018.

3. Bello, G., Giammatteo, V., Bisanti, A., et al. High vs Low PEEP in Patients With ARDS Exhibiting Intense Inspiratory Effort During Assisted Ventilation: A Randomized Crossover Trial. *Chest*. 2024.
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5. Mezidi, M., Parrilla, F.J., Yonis, H., et al. Effects of positive end-expiratory pressure strategy in supine and prone position on lung and chest wall mechanics in acute respiratory distress syndrome. *Ann Intensive Care*. 2018.
6. Taenaka, H., Yoshida, T., Hashimoto, H., et al. Individualized ventilatory management in patients with COVID-19-associated acute respiratory distress syndrome. *Respir Med Case Rep*. 2021.
7. Taenaka, H., Yoshida, T., Hashimoto, H., et al. Personalized ventilatory strategy based on lung recruitability in COVID-19-associated acute respiratory distress syndrome: a prospective clinical study. *Crit Care*. 2023.
8. Rosén, J., Frykholm, P., Jonsson Fagerlund, M., et al. Lung impedance changes during awake prone positioning in COVID-19. A non-randomized cross-over study. *PLoS One*. 2024.
9. Gibot, S., Conrad, M., Courte, G., Cravoisy, A. Positive End-Expiratory Pressure Setting in COVID-19-Related Acute Respiratory Distress Syndrome: Comparison Between Electrical Impedance Tomography, PEEP/FiO₂ Tables, and Transpulmonary Pressure. *Front Med (Lausanne)*. 2021.
10. Jonkman, A.H., Alcalá, G.C., Pavlovsky, B., et al. Lung Recruitment Assessed by Electrical Impedance Tomography (RECRUIT): A Multicenter Study of COVID-19 ARDS. *Am J Respir Crit Care*. 2023.
11. Pulletz, S., Krukewitt, L., Gonzales-Rios, P., et al. Dynamic relative regional strain visualized by electrical impedance tomography in patients suffering from COVID-19. *J Clin Monit Comput*. 2022.
12. de la Oliva, P., Waldmann, A.D., Böhm, S.H., Verdú-Sánchez, C., Pérez-Ferrer, A., Alvarez-Rojas, E. Bedside Breath-Wise Visualization of Bronchospasm by Electrical Impedance Tomography Could Improve Perioperative Patient Safety: A Case Report. *AA Case Rep*. 2017.

Weaning from Mechanical Ventilation

1. Wisse, J.J., Goos, T.G., Jonkman, A.H., et al. Electrical Impedance Tomography as a monitoring tool during weaning from mechanical ventilation: an observational study during the spontaneous breathing trial. *Respir Res*. 2024.

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Evaluation of Therapeutic Intervention

1. Grieco, D.L., Delle Cese, L., Menga, L.S., et al. Physiological effects of awake prone position in acute hypoxemic respiratory failure. *Crit Care*. 2023.
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4. Ukere, A., März, A., Wodack, K.H., et al. Perioperative assessment of regional ventilation during changing body positions and ventilation conditions by electrical impedance tomography. *Br J Anaesth*. 2016.
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