

## Intraoperative pleural rent during kyphosis surgery: Monitor tells before surgeons!!

Dear Editor,

Spine surgery is a complex surgery associated with complications even in the most experienced hands.<sup>[1]</sup> One of the known complications is intraoperative pleural injury especially with thoracic spine involvement.<sup>[2]</sup> We are reporting an intraoperative incident during thoracolumbar kyphosis correction surgery of a 13-year old female child (weighing 30 kg, 140 cm height) who underwent surgery involving fifth thoracic to second lumbar vertebral levels by posterior instrumentation. Kyphosis angle was 15° with no other systemic illness. After adequate fasting, child was shifted to OT and standard anesthesia monitors were attached. She was induced intravenously after securing an intravenous (i.v.) cannula and positioned prone after securing 6.5mm cuffed endotracheal tube. Initially during surgery, baseline ventilatory parameters were peak airway pressures of 18 to 19cm H<sub>2</sub>O and pulmonary compliance of 17ml/cm H<sub>2</sub>O. After 2 h of surgery, there was a sudden decrease in peak airway pressures (from 19 to 8cm H<sub>2</sub>O) and a marked increase in lung compliance (recorded in Dräger Primus anesthesia workstation) (from 17.2 to 48ml/cm H<sub>2</sub>O) [Figure 1a and b]. A fall in central venous pressure (CVP) from 9 to 5mmHg was noticed without significant blood loss and with adequate volume replacement [Figure 2a and b].

Considering close proximity of surgical field to pleura and nature of event, we suspected pleural injury possibly pleural rents. The relationship between transmural pressure and lung's volume is defined by compliance. Our lungs have an inherent tendency to collapse, whereas chest wall has tendency

to expand. These two opposing forces create a negative intrapleural pressure. For lung expansion, positive transmural pressure is required (intra-alveolar pressure > intrapleural pressure).<sup>[3]</sup>

The compliance curve is steeper at lower lung volumes and plateaus as volume increases meaning easier expansion of lung at lower lung volume when pulmonary compliance is high. This physiological phenomenon was clearly seen in our intraoperative findings.

1. Fall in peak airway pressures and dramatically increased compliance.
2. It normalised within a few minutes. [Figure 1a] picture after sealing of pleural rent.
3. Again after a few minutes peak pressures dropped from 19 to 8cm H<sub>2</sub>O and lung compliance increased from 17.2 to 48ml/cm H<sub>2</sub>O [Figure 1b].

The operating surgeon figured out the cause and repaired the pleural rent bilaterally. Due to rent in pleura, there was a loss of intrapleural pressure and the lungs that have a tendency to collapse showed an increased compliance due to markedly decreased lung volume, which normalised after repair and similar thing happened on the other side, [Figure 1b].

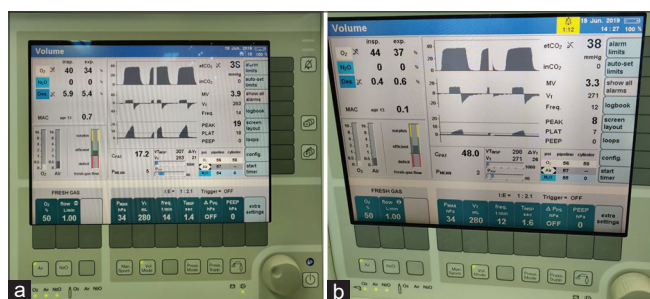
A fall in CVP was also noticed due to fall in intrathoracic pressure to 5mmHg [Figure 2b], which returned to baseline (9mmHg) after pleural repair [Figure 2a].

Our case, had an open pneumothorax due to large pleural rent as opposed to tension pneumothorax associated to a ball-valve mechanism in literature.<sup>[4,5]</sup> Timely diagnosis and repair of pleural rent can prevent post-operative pneumothorax.

Therefore, ventilatory parameters monitored by advanced anesthesia workstations can guide for early detection and immediate repair of large pleural rents even if it goes undetected by surgical team.

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Nil.



**Figure 1.** Intraoperative trends of peak airway pressure and compliance (a) after repair of one-sided pleural rent with normalized parameters and (b) at the time of pleural rent on other side showing fall in airway pressures and increase in compliance



**Figure 2.** Intraoperative central venous pressure (CVP) trends (a) after repair of one-sided pleural rent and (b) at the time of pleural rent on other side showing fall in CVP

## Conflicts of interest

There are no conflicts of interest.

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