Comparison of different positions of the safety frog™, a ventilator safety valve on the ventilator in case of technical failure

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Background and Goal of Study

- The safety frog from SafeMed is an intelligent ventilator safety valve (VSV) opening in case of a continuous elevated airway pressure.
- Goal of this study was to analyze what the best position is in case of a blocked inspiratory or expiratory valve and in case of an occluded inspiratory or expiratory tubing line.

Materials and Methods

- An artificial lung (no patient or animal) with a compliance of 12 ml/mmHg is connected to an aspire S/5 ventilator from Datex-Ohmeda.
- The active safety frog is put in four positions while the different defects are mechanical simulated during spontaneous (simulated with the artificial lung) and during controlled volume ventilation. The APL valve is kept open at a zero pressure.
- If a continuous pressures above 20 cmH2O is measured in the artificial lung in one of the simulated technical failures the position is noted as dangerous.

Results

- The table gives the results for the four different positions with four different technical failures.
- With an occluded expiratory tubing the patient can only inspire and not expire and will finally get a volutrauma if no VSV is positioned on the inspiratory circuit.
- An occluded inspiratory valve or inspiratory tubing never gives volutrauma in contrary to an occluded expiratory valve or expiratory tubing.
- A position between the manual breathing bag and ventilator fails to protect during mechanical ventilation because of exclusion.
- The expiratory circuit position at the ventilator fails to protect during occlusion of the expiratory tubing.
- The inspiratory circuit position is simpler than the patient’s connection position. Both protect the lungs in all investigated technical failures.

Conclusion

- The position of the VSV at the inspiratory circuit of the ventilator is mandatory to obtain the best safety protection.

Table

<table>
<thead>
<tr>
<th>position of safety frog</th>
<th>inspir valve occlusion</th>
<th>inspir tubing occlusion</th>
<th>exp valve occlusion</th>
<th>exp tubing occlusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>inspiratory circuit</td>
<td>no risk</td>
<td>no risk</td>
<td>protected</td>
<td>protected</td>
</tr>
<tr>
<td>expiratory circuit</td>
<td>no risk</td>
<td>no risk</td>
<td>protected</td>
<td>at risk</td>
</tr>
<tr>
<td>patient connection</td>
<td>no risk</td>
<td>no risk</td>
<td>protected</td>
<td>protected</td>
</tr>
<tr>
<td>manual circuit</td>
<td>no risk</td>
<td>no risk</td>
<td>at risk</td>
<td>at risk</td>
</tr>
</tbody>
</table>

References

Jan Paul J. Mulier et al. The Characteristics of an Intelligent New Ventilator Safety Valve ASA 2006 A941

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