

<b>Author Year</b> <b>Country</b> <b>Research Design</b> <b>Score</b> <b>Sample Size</b>	<b>Methods</b>	<b>Outcome</b>
<p><a href="#">Sustic et al. 2002</a> Croatia RCT PEDro = 3 Level 2 N = 16</p>	<p><b>Population:</b> Age range: 19-59 yr; Gender: male=13, female=3; Level of injury: C3-C6; Severity of injury: not specified.</p> <p><b>Intervention:</b> Patients were randomized to receive either a surgical tracheostomy (ST) or an ultrasound-guided percutaneous dilational tracheostomy (PDT).</p> <p><b>Outcome Measures:</b> The following post procedure: incidence of complications, duration of procedure.</p> <p><b>Chronicity:</b> Time since injury not specified. Average ICU LOS=22 days (ST) and 20 days (PDT).</p>	<ol style="list-style-type: none"> <li>1. No patients experienced any major complications due to either tracheostomy procedure.</li> <li>2. The duration of the PDT procedure was significantly shorter than the duration of the ST procedure (<math>p &lt; 0.05</math>).</li> </ol>
<p><a href="#">Leelapattana et al. 2012</a> Canada Cohort Level 2 N = 66</p>	<p><b>Population:</b> Mean age: 38 yr; Gender: male=50, female=16; Level of injury: C4-C7; Severity of injury: complete=12, incomplete=45.</p> <p><b>Intervention:</b> Patients either received a tracheostomy or did not.</p> <p><b>Outcome Measures:</b> The following at discharge: duration of MV, injury severity score (ISS). The following after three days of ventilation: ratio of arterial oxygen partial pressure to fractional inspired oxygen.</p> <p><b>Chronicity:</b> Patients included in the study were within 24 hr of sustaining injury upon hospital admission.</p>	<ol style="list-style-type: none"> <li>1. Patients who had a tracheostomy had a significantly lower motor score at discharge (<math>p = 0.04</math>), a longer hospital stay (<math>p &lt; 0.001</math>), a longer ICU stay (<math>p = 0.002</math>), and required MV for longer (<math>p = 0.001</math>) compared to patients who did not have a tracheostomy.</li> <li>2. Patients who had a tracheostomy had fewer pulmonary complications (<math>p = 0.001</math>) and fewer cases of death (<math>p = 0.025</math>) than patients who did not have a tracheostomy.</li> <li>3. ET correlated to fewer days on ventilation (<math>p = 0.038</math>) and fewer days</li> </ol>

		<p>spent in the hospital (p=0.004) compared to LT.</p> <ol style="list-style-type: none"> <li>The number of days spent in hospital increased by 2.3 days for every additional day from injury to tracheostomy (p&lt;0.001).</li> <li>An ISS score &gt;32, complete SCI, and a PF ratio &lt;300 on day 3 of ventilation were predictors for requiring MV for greater than 7 days.</li> </ol>
<p><a href="#">Romero-Ganuza et al. 2011a</a> Spain Cohort Level 2 N = 28</p>	<p><b>Population:</b> Mean age: 40 yr; Gender: male=23, female=5; Level of injury: cervical; Severity of injury: complete=21, incomplete=7; AIS A-C.</p> <p><b>Intervention:</b> All patients received a percutaneous tracheostomy following anterior cervical spine fixation.</p> <p><b>Outcome Measures:</b> Timing of tracheostomy, neurological deterioration, incidence of complications.</p> <p><b>Chronicity:</b> The mean time from injury to fixation surgery was 2.25 days. The mean time from surgery to tracheostomy was 8.25 days.</p>	<ol style="list-style-type: none"> <li>Patients received a tracheostomy an average of 8.25 days after they received spinal fixation surgery. Tracheostomy was performed within 6 days or less in 42.9% (12/28) of cases.</li> <li>No patients experienced neurological deterioration as a result of spinal surgery or tracheostomy procedure.</li> <li>No patient experienced an infection at the cervical fixation wound, however, 10.7% (3/28) of patients experienced minor complications at the tracheostomy site.</li> <li>The authors note that tracheostomy quickly performed after fixation surgery does not increase the rate of surgical wound infection.</li> </ol>
<p><a href="#">McCully et al. 2014</a> USA Case control Level 3 N = 256</p>	<p><b>Population:</b> Mean age: 46 yr; Gender: male=192, female=64; Level of injury: C1-T3; Severity of injury: complete=77, incomplete=179.</p>	<ol style="list-style-type: none"> <li>Patients who received a tracheostomy had more days on a ventilator than patients who did not receive a tracheostomy (p&lt;0.05).</li> <li>The occurrence of complete injury and</li> </ol>

	<p><b>Intervention:</b> Patients either received a tracheostomy or did not.</p> <p><b>Outcome Measures:</b> The following retrospectively: number of days on ventilator, severity of injury.</p> <p><b>Chronicity:</b> Time since injury not specified. Median hospital LOS was 7 days (no tracheostomy) and 33 days (tracheostomy).</p>	<p>intubation was higher in patients who received a tracheostomy (<math>p &lt; 0.05</math>) than patients who did not.</p>
<p><a href="#">Berney et al. 2011</a> Australia Case control Level 3 N = 114</p>	<p><b>Population:</b> Mean age: 32 yr; Gender: male=86, female=28; Level of injury: C0-C8; Severity of injury: complete=72, incomplete=42; AIS A-D.</p> <p><b>Methods:</b> Patients who were extubated were compared to patients who received a tracheostomy.</p> <p><b>Outcome Measures:</b> The following during hospital stay: pulmonary secretion production, number of associated injuries, mental state, ASIA score, ratio of arterial oxygen partial pressure to fractional inspired oxygen, FVC.</p> <p><b>Chronicity:</b> Time since injury not specified.</p>	<ol style="list-style-type: none"> <li>1. Patients with a tracheostomy produced significantly more pulmonary secretions (<math>p = 0.003</math>), had significantly more associated injuries (<math>p = 0.02</math>), had a more alert mental state (<math>p = 0.005</math>), and had more complete injuries (<math>p = 0.026</math>) compared to patients who were extubated.</li> <li>2. Patients with a tracheostomy had significantly lower gas exchange (<math>p = 0.02</math>) and FVC (<math>p &lt; 0.001</math>) than patients who were extubated.</li> </ol>
<p><a href="#">Berney et al. 2008</a> Australia Case control Level 3 N = 71</p>	<p><b>Population:</b> Mean age: 40 yr; Gender: male=46, female=25; Level of injury: C1-C8; Severity of injury: complete=45, incomplete=26; AIS A-D.</p> <p><b>Intervention:</b> Patients either received tracheostomy following anterior cervical spine fixation or posterior spine fixation (control group).</p> <p><b>Outcome Measures:</b> The following retrospectively: timing of the tracheostomy</p>	<ol style="list-style-type: none"> <li>1. There were no significant differences between the timing of tracheostomy in patients who received it after anterior cervical spine fixation compared to patients who received it after posterior fixation (<math>p = 0.09</math>).</li> <li>2. 24% (17/71) of patients developed an infection at the tracheostomy site or cervical site. Patients who</li> </ol>

	<p>since surgery, prevalence of infection.</p> <p><b>Chronicity:</b> The median time from injury to stabilization surgery was 3 days. The mean time from surgery to tracheostomy was 3.8 days (anterior fixation) and 3.1 days (posterior fixation).</p>	<p>received a tracheostomy after posterior fixation developed significantly more incision site infections than patients who received a tracheostomy after anterior fixation (<math>p &lt; 0.05</math>).</p>
<p><a href="#">Berney et al. 2002</a> Australia Case control Level 3 N = 14</p>	<p><b>Population:</b> Mean age 28 yr; Gender: male=11, female=3; Level of injury: cervical; Severity of injury: complete.</p> <p><b>Intervention:</b> Patients who received a tracheostomy were compared to patients who were extubated and received physiotherapy.</p> <p><b>Outcome Measures:</b> The following at the time of extubation/the day of tracheostomy: FVC, PaO<sub>2</sub>/FiO<sub>2</sub>, total number of physiotherapy treatments, number of physiotherapy treatments in ICU, LOS in ICU, days requiring MV, LOS in acute ward after discharge from ICU, days from injury to fixation.</p> <p><b>Chronicity:</b> The mean time from injury to fixation was 1.9 days.</p>	<ol style="list-style-type: none"> <li>1. There was no significant difference in FVC between tracheostomized patients and physiotherapy patients (<math>p &gt; 0.05</math>).</li> <li>2. There was no significant difference in PaO<sub>2</sub>/FiO<sub>2</sub> ratios between tracheostomized patients and physiotherapy patients (<math>p &gt; 0.05</math>).</li> <li>3. There was no significant difference in total number of physiotherapy treatments between tracheostomized patients and extubated patients. Patients who were extubated and received physiotherapy required significantly fewer treatments compared to tracheostomized patients in ICU (<math>p = 0.047</math>).</li> <li>4. Tracheostomized patients spent significantly more days in ICU than physiotherapy patients (<math>p = 0.006</math>) and required MV for significantly longer than the physiotherapy group (<math>p = 0.018</math>).</li> <li>5. There was no significant difference in the LOS in the acute ward between groups (<math>p &gt; 0.05</math>).</li> </ol>

		6. There was no significant difference in the time from injury to fixation between groups ( $p>0.05$ ).
<p><a href="#">Kornblith et al. 2014</a> USA Case series Level 4 N = 344</p>	<p><b>Population:</b> Mean age: 43 yr; Gender: male=275, female=69; Level of injury: cervical to lumbar; Severity of injury: complete=69, incomplete=275.</p> <p><b>Intervention:</b> Patients either had a tracheostomy or did not. In addition, patients were either mechanically ventilated at discharge or were not.</p> <p><b>Outcome Measures:</b> The following retrospectively: instances of prolonged MV, ventilator-associated pneumonia (VAP), acute lung injury (ALI), duration in ICU, duration in hospital, number of ventilator-free days, extubation attempts, ISS.</p> <p><b>Chronicity:</b> Time since injury not specified. Average number of hospital days=20.</p>	<ol style="list-style-type: none"> <li>1. Patients who received a tracheostomy were associated with a 14.1-fold higher odds of requiring prolonged MV (<math>p&lt;0.05</math>) compared to patients who did not receive a tracheostomy.</li> <li>2. Patients who received a tracheostomy had fewer ventilator-free days (<math>p&lt;0.05</math>) compared to patients who did not receive a tracheostomy.</li> <li>3. Patients who had a tracheostomy required MV at discharge more often than patients who did not have a tracheostomy (<math>p&lt;0.05</math>).</li> <li>4. Patients who required MV at discharge had a higher ISS (<math>p&lt;0.05</math>), significantly higher rates of VAP (<math>p&lt;0.05</math>) and ALI (<math>p&lt;0.05</math>), and longer ICU (<math>p&lt;0.05</math>) and hospital stays (<math>p&lt;0.05</math>) compared to patients who did not require MV at discharge.</li> </ol>
<p><a href="#">O'Keefe et al. 2004</a> USA Case series Level 4 N = 17</p>	<p><b>Population:</b> Mean age 43 yr; Gender: male=12, female=5; Level of injury: cervical; Severity of injury: not specified.</p> <p><b>Intervention:</b> All patients received a tracheostomy following anterior cervical spine fixation.</p> <p><b>Outcome Measures:</b> The following after tracheostomy: neurologic deterioration,</p>	<p>Overall Analyses:</p> <ol style="list-style-type: none"> <li>1. No patients experienced neurologic deterioration after tracheostomy following spine fixation.</li> <li>2. No patients developed infections at the anterior cervical fusion site following tracheostomy. 82% (14/17) patients developed pneumonia. There were no deaths</li> </ol>

	<p>incidence of complications, mortalities, injury severity.  <b>Chronicity:</b> Time since injury not specified.</p>	<p>related to airway difficulties.  Analyses of entire population of patients with cervical SCI, including patients that did not receive an anterior cervical spine fixation (N=60):</p> <ol style="list-style-type: none"> <li>3. The need for a tracheostomy correlated with injury severity (<math>p &lt; 0.001</math>) with ASIA level A and B patients requiring the most tracheostomies.</li> </ol>
<p><a href="#">Quesnel et al. 2015</a>  France  Retrospective review  Level 4  N = 108</p>	<p><b>Population:</b> N=108 patients with cervical SCI and tetraplegia (86M, 22F). Mean (SD) age: 49.0 (21.1) years.  51 AIS-A, 22 AIS-B, 19 AIS-C, 10 AIS-D (out of 103 patients).  <b>Treatment:</b> Tracheostomy (44/108 patients).  <b>Outcome Measures:</b> Institutionalization status, decannulation status, length of treatment.</p>	<ol style="list-style-type: none"> <li>1. Out of 44 tracheotomized patients, 25 decannulated at mean of 84.1(59.1) days; 12 expired; 7 could not be weaned (3 of which expired at a mean treatment duration of 202.3(121.7) days; the others have had 727.7(283.6) days of treatment at end of study).</li> <li>2. At end of study, 9 patients definitively institutionalized, 61 returned home.</li> </ol>