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Effekt av lungefunksjonstrening i akuttfasen for pasienter med traumatisk, høy ryggmargsskade

En systematisk oversikt

Effect of respiratory muscle training for acute traumatic high spinal cord injury: a systematic review

This is an excerpt from the full technical report, which is written in Norwegian. The excerpt provides the report's main messages in English.

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Key messages

Pulmonary complications are the leading cause of illness and death in people with traumatic spinal cord injuries, both in the short- and long term after the injury. We have synthesized the available research regarding the effect of various treatment strategies for respiratory management of traumatic, high spinal cord injury within the first eight weeks after injury. We did not include pharmacological or surgical interventions in this report.

We found that:

- Respiratory muscle training may improve maximal inspiratory pressure, but it is uncertain whether it has an effect on maximum expiratory pressure.
- We do not know if mechanical or manual assisted cough has the best effects on lung function for patients in the acute phase.
- We found no studies on postural drainage or non-invasive breathing support.
- There is a lack evidence on survival, adverse events, days on ventilator, patient days in hospitals, asthma or chronic obstructive pulmonary disease later on.

The evidence is sparse for treatment strategies for respiratory management of acute traumatic, high spinal cord injury in hospital. Although respiratory difficulties are a major complication and frequent cause of death and prolonged hospital stay, no studies reported survival and patient days in hospital.

Studies in this field should involve several clinics or countries to get enough participants to identify effects of interventions.

Title:
Effect of respiratory muscle training for acute traumatic high spinal cord injury: a systematic review

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Type of publication:

Systematic review
A review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyse data from the studies that are included in the review. Statistical methods (meta-analysis) may or may not be used to analyse and summarise the results of the included studies.

Doesn't answer everything:

-Excludes studies that fall outside the inclusion criteria

-No health economic evaluation

-No recommendations

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Ingeborg Beate Lidal, MD phd, National Resource Centre for Rare Disorders, Sunnaas Rehabilitation Hospital and Ellen Eckhoff Holsvik, physiotherapist, Haukeland University Hospital

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Executive summary (English)

Background

Pulmonary complications are the leading cause of illness and death in people with spinal cord injuries, both in short- and long term after the injury. In the acute phase, 84% of patients with injuries over fourth cervical vertebra (C4) and 60% with neck injuries under C4 will experience respiratory problems. The most common pulmonary complications are atelectasis, pneumonia and ventilation failure. In the acute phase, 80% of deaths are secondary to pulmonary complications for patients with high spinal cord injury. The acute phase may be divided into three phases: early acute (from two to 48 hours), subacute (from two days to two weeks) and an intermediate phase that can last from two weeks to six months.

Objective

We synthesized the available research regarding the effect of various treatment strategies for respiratory management of acute traumatic, high spinal cord injury in hospital. We did not include pharmacological- or surgical interventions in this report.

Method

We conducted a systematic review. We searched in the following databases: MEDLINE, Embase, Pedro, Cochrane CENTRAL and CINAHL in September 2016. We used thesaurus term and text words for spinal cord injuries, combined with text words for relevant lung function tests and treatment methods, and limited the search filter for relevant study design. Inclusion criteria: 1. Study with control group, 2. Patients with high traumatic spinal cord injury over sixth thoracic vertebra (Th6), 3. Interventions aimed at lung function in acute phase (defined as <8 weeks), 4. Compared with standard care or other active measures 5. Outcomes; pulmonary function, respiratory complications, days on ventilator, patient days in hospital, survival, quality of life later on, adverse reactions, asthma and Chronic Obstructive Pulmonary Disease (COPD) later on.

Two researchers independently screened titles and abstracts according to pre-defined selection criteria and independently assessed risk of bias in the included studies. We used fixed effects model in the meta-analyses and presented the data as mean difference (MD) with 95% confidence intervals. We summarized the results in text and tables. We assessed the certainty of the evidence, or our confidence in the results, using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) tool and described the certainty of the evidence as: high (⊕⊕⊕⊕), moderate

(⨁⨁⨁⊖), low (⨁⨁⊖⊖) or very low (⨁⊖⊖⊖). We often use standard ways of expressing the certainty of the effect estimates. We use *may* when the evidence is of low certainty and *probably* when the evidence is of moderate quality. If the evidence is of very low certainty, we say that we are *uncertain* of the effect estimate.

Results

We included seven randomized controlled trials, including one study with crossover design. We found no studies on the effect of postural drainage or non-invasive breathing support.

Six studies examined various forms of respiratory muscle training and one study compared the effects of mechanical and manual assisted cough. In two trials only, the patients got the interventions in the acute phase (< 2 months after the injury). We also included studies in which patients got the intervention the first six months after the injury, and where some of the patients got the intervention within two months after the injury. We merged the results from the six studies on respiratory muscle training, even though the interventions and control group were different and patients received the intervention at different times after injury.

Effect of mechanical insufflation and exsufflation (mechanical assisted cough)
One study examined the effect of mechanical insufflation and exsufflation compared to manual assisted cough. The study included nine patients, of whom five received the intervention and four the comparison during the acute phase. The outcomes were reported at end of treatment. There was no difference between the groups on outcomes: Forced vital capacity (MD 0.03, 95% CI -0.33 to 0.39) (⨁⊖⊖⊖), maximum expiratory flow rate (MD -0.07, 95% CI -0.37 to 0.23) (⨁⊖⊖⊖). For oxygen saturation (MD -10.40, 95% CI -42.91 to 22.11) (⨁⊖⊖⊖) and carbon dioxide in the blood (MD -3.40, 95) (⨁⊖⊖⊖) the confidence intervals are wide and it is uncertain whether there is any difference in effect. We have no data on outcomes: Respiratory complications, survival, adverse events, days on ventilator, patient days in hospital, quality of life later on, asthma or COPD later on.

Effect of respiratory muscle training
Six studies examined the effects of respiratory muscle training compared to sham training, standard treatment, no training or other active exercise. Respiratory muscle training may have a small positive effect on maximum inspiratory pressures (MD 9.56, 95% CI 2.12 to 16.99) (⨁⨁⊖⊖), but it is uncertain whether respiratory muscle training have an effect on maximum expiratory pressure (MD 4.43, 95% CI -2.72 to 11.58) (⨁⨁⊖⊖). There was little or no difference in forced vital capacity (MD 0.12, 95% CI -0.24 to 0.48) (⨁⨁⊖⊖) and peak expiratory flow (MD 0.28, 95% CI -0.43 to 1.00) (⨁⨁⊖⊖). It is uncertain whether respiratory muscle training have effect on vital capacity (MD 0.12, 95% CI -0.32 to 0.55) (⨁⊖⊖⊖) and quality of life over the long term (MD 1.00, 95% CI-12.95 to 14.95) (⨁⊖⊖⊖). One small study showed that patients in the intervention group had some less breathing problems than patients in the control group (MD -1.60, 95% CI -2.46 to -0.74) (⨁⊖⊖⊖). The certainty of the evidence for

this outcome is very low, the results are very uncertain. Two studies reported respiratory complications. None of the studies reported: Survival, adverse events, days on ventilator, and patient days in hospitals, asthma or COPD later on.

Discussion

The evidence is sparse for treatment strategies for respiratory management of acute traumatic, high spinal cord injury in hospital. Respiratory muscle training may improve maximal inspiratory pressure, but we are uncertain whether respiratory muscle training has an effect on maximum expiratory pressure. We do not know if mechanical or manual assisted cough has better effect on forced vital capacity, maximum flow rate or blood gas measurements. We found no studies on postural drainage or non-invasive breathing support. We lack evidence on survival, adverse events, days on ventilator, patient days in hospitals, asthma or COPD later on.

The problem for this field is that there is a small patient base, which has led to small studies. When studies are few and have few participants this contribute to uncertain results, (confidence intervals in meta-analysis are wide). There is also a problem with drop out in some of the studies.

We conducted a wide literature search for different study designs with control group and it is likely that we have found the available science. It is possible that search for studies without control group could have contributed to an increased understanding of other research questions such as which measurement are suitable for monitoring lung function in acute phase for patients with high spinal cord injury.

We merged results from six studies on respiratory muscle training, although interventions groups and control groups were different and patients received the interventions at a different time after injury. Although measurements are objective, we agree that there are problems with reliability for several lung function measurement, the measurement have to be repeated several times to get an accurate measure. This can be problematic for a sick patient group.

The evidence is sparse for treatment strategies for respiratory management of acute traumatic, high spinal cord injury in hospital. Although pulmonary complications is a frequent cause of death and often cause prolonged hospital stay, no studies reported survival and patient days in hospital. Studies in this field should go across clinics or countries so that one gets enough participants to reveal potential effects of interventions.

Conclusion

The evidence is sparse for treatment strategies for respiratory management of acute traumatic, high spinal cord injury in hospital. Respiratory muscle training may improve maximal inspiratory pressure, but it is uncertain whether respiratory muscle training has an effect on maximum expiratory pressure. We do not know if mechanical or manual assisted cough has the best effect on lung function. We found no studies on the effect of postural drainage or non-invasive breathing support.