



A comparison of intrapulmonary percussive ventilation and conventional chest physiotherapy for the treatment of atelectasis in the pediatric patient.

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OBJECTIVE: Compare intrapulmonary percussive ventilation (IPV) to conventional chest physiotherapy (CPT) and determine their effects on improving atelectasis and static compliance in pediatric patients.

METHODS: We conducted a retrospective study of 46 patients who received IPV therapy with the Percussionator IPV-1 ventilator at frequencies of 180-220 cycles/min and pressures of 15-30 CmH₂O. Medicated aerosol therapy with albuterol 2.5 mg in 6 mL normal saline solution was delivered with each IPV treatment. Baseline and subsequent chest radiographs were evaluated by a pediatric radiologist. We used an ordinal scoring system to measure the degree of atelectasis to evaluate chest radiographs (4 = complete collapse, 0 = complete resolution). Then we conducted a prospective, randomized, controlled study of intubated and mechanically ventilated patients to compare changes in atelectasis and static compliance. Baseline and daily chest radiographs were evaluated using the same scoring system as in the retrospective pilot evaluation. Patients were ventilated in the volume-controlled, synchronized intermittent mandatory ventilation mode, with tidal volumes of 6-10 mL/kg. Patients were randomized to CPT (clapping and vibration) or IPV at frequencies of 180-220 cycles/min and pressures of 15-30 CmH₂O (equal to the peak pressures on the ventilator), with 6 mL of normal saline solution via medicated aerosol. Both treatments were given every 4 h and lasted 10-15 min. Static compliance measurements were calculated from exhaled tidal volumes and plateau pressures.

RESULTS: In the retrospective study the median age of patients receiving IPV was 4.2 years and the median duration of IPV was 6.2 days. A change in atelectasis score from 3 to 1 ($p < 0.001$) was seen. In the randomized, controlled trial the median age of patients was 3.1 years. Atelectasis scores before treatment were comparable between the CPT and IPV groups (median 2.0 for both groups, $p = 0.530$). Atelectasis scores after treatment were unchanged in the CPT group (median 2.0, $p = 0.421$) but improved in the IPV group (median 1.0, $p = 0.026$). Treatment lasted an average of 6.2 days in the CPT group and 2.1 days in the IPV group ($p = 0.018$). Neither group showed any change in static compliance following treatment.



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CONCLUSIONS: In the retrospective study a clinically important improvement in atelectasis was seen in patients who received IPV therapy. In the controlled, clinical trial the IPV group showed more clinically important improvement in atelectasis than the CPT group. IPV is a safe and effective method of alternative airway clearance and can be used on patients with artificial airways.

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